RAILROAD GAZETTE

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CONTENTS

Contributions

The Cost of Handling Locomotives at Terminals.

Portsmouth, Va., Feb. 27, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the article on the cost of handling locomotives at terminals with much interest. Our method of keeping track of terminal expenses is the most effective and reliable that we know of, and has been used on railroads with which the writer has been connected for many years with very good results. But there are few places that can be expected to be run at the same cost per engine handled, and in comparing the performance of one road with another the figures mean nothing, unless full explanation is given as to just what is charged into these figures and what is excluded; also of the facilities at the different terminals and the class of service given.

For instance, the cost at a point where running repairs are mostly made should, naturally, be much higher than at a point where engines are turned around in the shortest possible time, and just enough done to bring the engine back to the main repair shop. A road so situated that it is compelled to have a considerable number of general running repair points is again at a disadvantage as compared with one whose lines radiate in such a way that they can concentrate and thus cheapen the general running repairs at one or a few main centers. The question as to whether any share of the foreman's time and other fixed expenses are included should be known.

In the case of hostlering, whether this cost is high or low depends a good deal on distance engines have to be moved between the roundhouse and terminal, and if the engines are so handled by hostlers or by engineers. Locally, this varies considerably on our own road. Also, the character of wiping and cleaning required for freight and passenger engines, as the wiping and cleaning will be greater where a large number of passenger engines are handled.

It seems to me this would be an interesting matter to be taken up and agitated and brought before the Master Mechanics' Association convention this summer, with a view to seeing whether the railroad companies could not get together and agree upon a uniform system of keeping this and other cost records so we could profit by one another's experience in such matters.

R. P. C. SANDERSON,
Sup't Motive Power, Seaboard Air Line.

Simplifying Night Signals and Shortening Block Sections.

TO THE EDITOR OF THE RAILROAD GAZETTE:

At a recent meeting of the Railway Club of Pittsburg an interesting paper on block signals was read by Mr. A. M. Schoyer, General Superintendent of the Northwest System of the Pennsylvania Lines West of Pittsburg, in which were many good things; but, if Mr. Schoyer will pardon me, I wish to call attention to one or two points which seem to call for comment and, I think, criticism. Those parts of the address which are commendable are equally worthy of notice, for he is a railroad officer of excellent reputation and long experience, and is a member of the Train Rules committee of the American Railway Association; but this more important part of his address is evidently intended for an audience not so well informed on these subjects as yours is.

After showing the disadvantages of white as a safety indication, Mr. Schoyer says:

There are serious objections to the use of green for safety, the principal one of which being that the safety signal on high-speed railroads should be given to the engineman as far in advance as possible, so that he may maintain high speed, and we all know that in the green signal a large number of the rays of light are absorbed, so that the signal cannot be seen for any great distance. There is also an objection to the use of yellow for a caution signal on railroads which use a permissive block, or on railroads which have but one signal to indicate the condition of two blocks in advance. It is very difficult to distinguish the yellow from the red where they are used in the same locality or on the same signal mast. . . . The possibility of mistaking a red signal for a yellow signal involves so many chances of accident that it would seem proper to pursue the investigation further as to whether, after all, something better than a colored light cannot be evolved to indicate night signals.

And he goes on to consider what has been done. He speaks of illuminated blades; blades with incandescent electric lights on their faces; blades made visible by having a bright light shining upon their faces, and electric headlights on locomotives. But the plan which he evidently most favors is to "erect one or two arc lights at every tower," thus making signal lights unnecessary.

Why should green be thus summarily dismissed? The principal objection to it is that it cannot be seen a great distance; but as against this we have the fact that signals perform their most useful function at times when distance does not count; in times of dense fog. When a fog prevails no signal light can be seen more than a few hundred feet. In other words, all signals should be so located as to provide for safety and speed in spite of the fact that they cannot be seen far off. An enormous amount of mental and financial energy has been wasted in this country in trying to make signals visible long distances. The only tangible return that we have got for this expenditure of energy is a class of engine runners who are less careful than they would be if they had not been encouraged to indulge in practices in fair weather which they must abandon in thick weather.

The Chicago & North Western and the New York, New Haven & Hartford have used green now for many years; what about their experience? The time is past when anybody should bring forward arguments against green lights unless he has experience to support his claims.

Next, Mr. Schoyer assumes that if green is used for the clear signal yellow must be used for caution (though the C. & N. W. succeeds without yellow), and he repeats the old objection of the likeness between red and yellow, and he mentions the possibility of mistaking red for yellow. In all of the discussions on this subject during the past five years I have never before come across this claim. It must be readily admitted that yellow may be mistaken for red, but the converse of this by no means follows. It might be said that after an engineman has convinced himself that the two colors are nearly alike he will then become reckless and always treat them alike: but no shred of evidence has ever been brought forward to substantiate this conjecture.

But all of these sophistications about the likeness of red and yellow have been predicated entirely on a single shade of yellow, that used on the New York, New Haven & Hartford. Why not use a lighter tint? In fact, I believe that the Erie Railroad has a lighter tint in use. No one will dispute the practicability of making a yellow glass which shall be light enough to be always easily distinguished from red (except, perhaps, in certain kinds of dense smoke—smoke which would vitiate a signal light of any color). It is perfectly practicable to use such a light. Take the most difficult condition imaginable, a three-indication signal, like Grafton's automatics on the Fort Wayne road; if green indicates all-clear and red indicates stop, surely a yellow can be produced to indicate caution which shall be always quickly distinguishable from either green or red. The only desideratum is to make your yellow glass light-colored enough. There is no danger of making it too light; if it should be made too light it would become like a common uncolored light, such as we now use to indicate "proceed," and erroneously call white. But white would then have no value as a signal indication and therefore no harm would be done.

Unless there is some error in the foregoing, the conclusion is irresistible that the possibility of mistaking red for yellow does not "involve many chances of accident," as Mr. Schoyer claims. His suggestion to use arc lights at every tower is quite superficial as a remedy, for it makes no provision for distant signals, or for any signals which are sufficiently isolated to forbid the expense of an arc light.

The other point which I wish to criticize is that concerning the length of block sections. On this Mr. Schoyer says:

A few years ago it was thought that signals could not be placed too close together, and the consequence was that in the adoption of any up-to-date block signal system the signal stations were placed at intervals of from one-quarter to one-half mile. It has been found that with very fast trains the enginemen must be under a strain constantly on account of the frequency of these signals, and that they really react on the speed of the trains. The tendency today, therefore, is to place the signals as far apart as is consistent with the number of trains which must be moved over the territory in a given time.

But if the number of trains is large the only "consistent" arrangement is to make your blocks as short as possible: say, 800 ft. or even 500 ft. It is not the shortness of the block that reacts on the speed of trains, it is the shortness of the distance between the home and the distant signal; and this distance need not be limited by the length of the block. Mr. Schoyer himself mentions the automatic signals which are in use on the Pennsylvania between Gallitzin and Altoona, where each home signal has a distant signal two sections in the rear. What is to hinder having the distant signal three sections in the rear, or four? Or five? It may be well enough, on the score of convenience and simplicity, or on account of expense, to call a halt in the process of shortening block sections, but from a strictly scientific standpoint there would seem to be no rational basis for the view set forth by Mr. Schoyer. He is not, of course, the only one who has given expression to this idea.

In England some effort is made to have distant signals fixed at one uniform distance from the home signal, or within small variations from such uniform distance. It would be well if we in this country should give more attention to this idea. If our distant signals were fixed at a uniform distance from the corresponding stop signal of, say, 3,000 or 3,500 ft., an engineman would then always know how much room was available to stop in and it would make no difference whether he did or did not encounter another signal between the home and the distant, or whether there were two or three such other signals.

Mr. Schoyer is fortified in his views, no doubt, by actual practice; by what has been done by prominent signal engineers and manufacturers; but in our efforts to provide a thoroughly scientific and practical arrangement of signals we need to be on our guard against accepting the practice, even of the best roads, as exemplifying the best principles; for when it comes to spending good money for real signals nearly every railroad manager seems to be ready to compromise with his principles, however sound may be his views when he is giving instructions about signals in the drafting room.

E. C. B.

Rubber Insulation.

The efforts of signal engineers and other users of insulated wires to secure high grade insulation, usually specified as 30 per cent. para, are as praiseworthy as they are futile. The larger users have already learned that the best guarantee is the reputation of the manufacturer for turning out wires and cables that stand the practical test of service, and that iron-clad specifications are as unavailing to hold dishonest manufacturers as they are annoying to honest ones. The users of signal cables are now in the throes of the transition period and are vainly endeavoring to draw their specifications, so as to eliminate all possibility of fraud. Details of the specifications are often suggested by certain favored manufacturers who are shrewd enough to make the specifications favor their particular brand. They often succeed in convincing signal engineers that qualities peculiar to their own brand are the true test of good insulating properties, whereas the opposite may be the truth.

This does not mean that definite specifications are altogether useless, but that too much importance should not be attached to them. Let us consider for a moment some of the usual tests and their value. The ash test will determine the percentage of mineral matter but will not show the quality of the insulating material with which the mineral matter is compounded. Specific gravity is almost valueless in determining the quality of the insulation, as a compound containing little or no rubber can be made to give the same specific gravity as a high grade para compound. Chemical analysis is of more value, but is by no means a sure method of determining either the dielectric qualities or the life of a compound. Extraction by acetone is the usual form of chemical analysis, the extractive matter being resinous. Of this the cheaper grades of rubber usually contain a higher percentage than the paras. There is a decided variation, however, in the extractive matter obtained from vulcanized para compounds, the cause of which it is not necessary to dwell on here. Carl Otto Weber's work, "The Chemistry of India Rubber," goes fully into this matter. A point entirely overlooked by those basing their opinion of a vulcanized rubber compound on chemical analysis is this: A 30 per cent. compound should show 70 per cent. mineral matter. Now mineral matter is an adulterant and has little or no dielectric qualities: and a compound showing a large decrease in mineral matter, even if the extractive matter is slightly increased, would indicate a better and longer lived dielectric. The writer has known a compound to be accepted showing 70 per cent. of mineral matter and 30 per cent. of rubber gum, while another compound was rejected that showed only 57 per cent. of mineral matter and 43 per cent. of gum, because the gum showed an increase of about 3 per cent. in extractive matter. The rejected compound was undoubtedly a better and longer lived dielectric.

Some engineers who have been in the habit of using a soft, extremely elastic compound which adheres very firmly to the wire and gives very high insulation, have been persuaded by the manufacturer that these qualities are the only ones by which the dielectric value of a compound can be determined and that any compound not exactly like theirs is inferior. Let us consider this statement.

It is well known that by the use of certain adulterants a much higher resistance can be obtained than by a pure 30 per cent. para mixture. The only way an honest manufacturer can meet these excessive resistance tests is by the use of a tubing machine, with which the com-

pound is put on under considerable pressure. This makes it dense and does away with seams, a source of weakness.

A well known railroad, through its signal department, has recently sent out specifications requiring that a strip of rubber cut from the cable shall stretch four times its length. This is the height of absurdity, and was undoubtedly suggested by some manufacturer who knew it would be particularly favorable to his brand. No properly vulcanized rubber compound will give any such result. It can be obtained only by using such a large percentage of para that the price would be prohibitory; and there would be no advantage in such a compound even if price were not considered; nor by using softening adulterants. That this latter method is employed is proved by the fact that such compounds become very soft, like cold molasses, at a temperature that will not appreciably affect a vulcanized para rubber compound.

A firm adherence of the rubber to the conductor is essential, but even this can be carried too far. As to the three qualities just spoken of, a happy medium would be the following:

The insulation should adhere to the conductor sufficiently to prevent ingress of moisture, but not so as to require a great amount of cutting and scraping before the copper is clean enough to make a good connection. Some users of insulated wires require that the rubber shall be easily removable. This is going to the other extreme. While the rubber is not supposed to furnish mechanical protection, a very soft compound is easily dented and injured by handling even when protected by tape and braid. The rubber should be sufficiently hard to stand ordinary handling and yet soft and elastic enough to sustain no injury from the twisting and turning incident to installing. Excessive requirements in either case, as in the elasticity test just given, tend to lessen the value of the insultation.

Any one familiar with rubber compounds learns through long experience to judge pretty accurately of the value of a dielectric by its general appearance and feeling. This ability cannot be imparted nor formulated; it is something like the ability possessed by some bank officials to detect a counterfeit bill among any number of good ones by merely feeling it. The writer has seen an engineer, who believed he knew how to detect at once an inferior compound, cut off a small strip of rubber from a cable, give it a sudden strong pull, subjecting it to a strain far in excess of any it would receive in ordinary use, and, because it broke, pronounce it bad. The same piece gently worked for a few seconds would have shown much greater elasticity and strength, as rubber compounds have a tendency to become set. If a roll of pure para imported splicing tape, the strongest and purest form of para, is kept some time at tension, it becomes hard and seems to have lost all elasticity. Plunge it into hot water and almost instantly it recovers its elasticity fully.

This may seem rather a negative argument, casting doubt on well known tests and suggesting no better ones to replace them. It is not the use but the abuse of these tests that the writer wishes to condemn. It is the exaggeration of their importance and the lack of knowledge of modifying conditions that do harm.

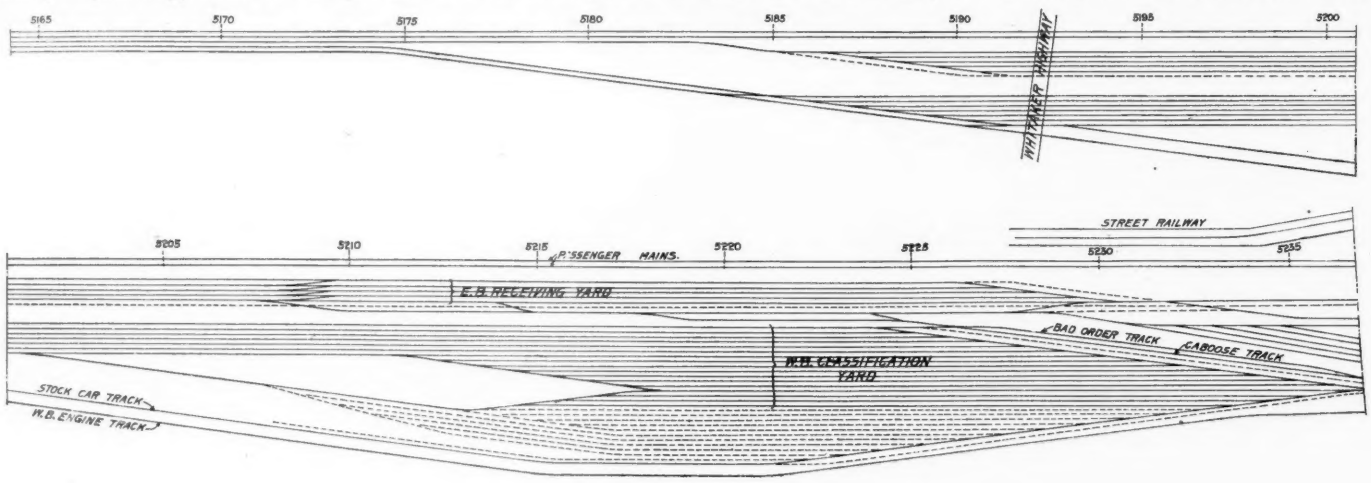
The engineer should insist on a certain thickness of wall, an insulation resistance test sufficient to show a good factor of safety, say not less than 500 megohms on a 14 B. & S. with $^{2}/_{64}$ in. wall, and in some cases a pressure test. Beyond this he should be governed largely by the reputation of the manufacturer and the practical working of the cables furnished. Moreover he should not constantly endeavor to force down the prices of a manufacturer who is giving satisfaction by comparing them with quotations from others whose product is not so good. Close bargains are all right, but some consideration should be given to a manufacturer whose goods have proved their value, and he should not be forced into a position of choosing between cheapening his compound or losing the business. The lower grade compounds are as well known to the manufacturer of high class cables as to the manufacturer of low class; the difference being that one will use the low grade compound whenever possible, and the other only when he finds that reputation and quality count for nothing as against low price.

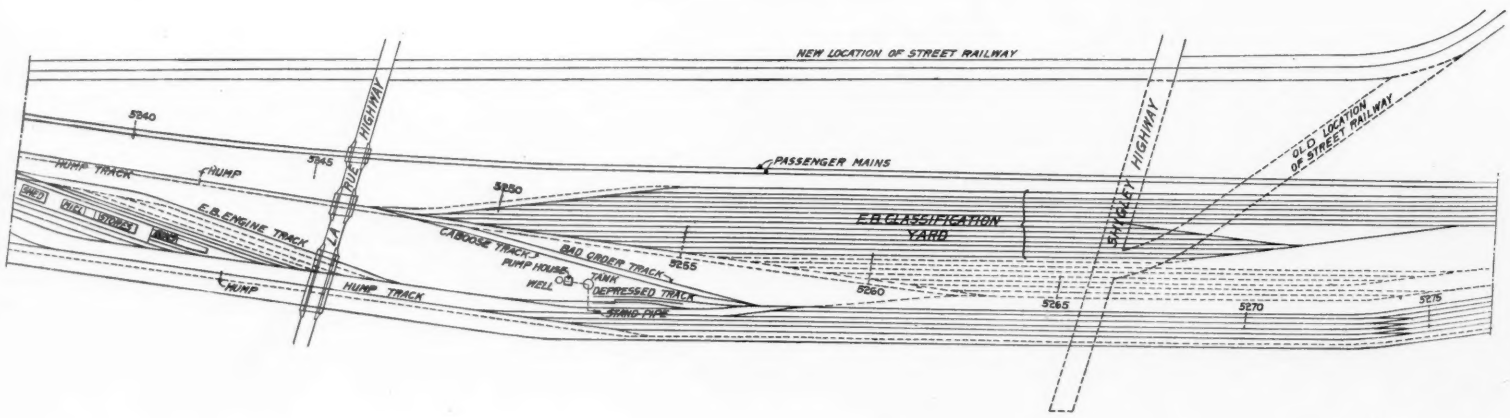
New Freight Yard of the Lake Shore at Elkhart, Ind.

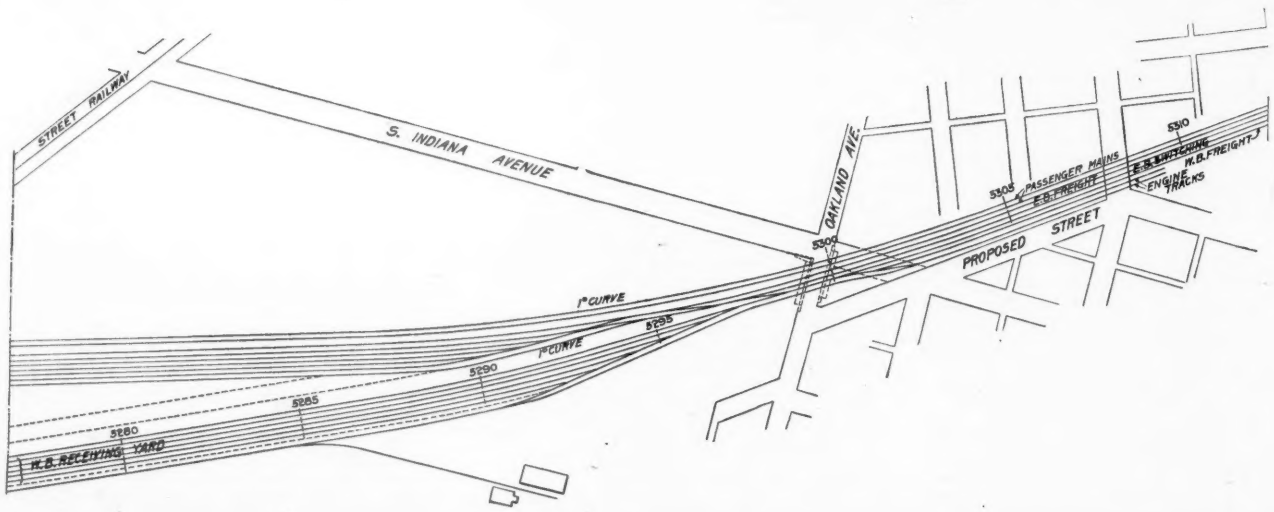
The Lake Shore has had in operation about three months a new gravity freight yard at Elkhart, Ind. Elkhart is a division point and all freight going east or west is classified in these new yards. Another new yard, similar to the one at Elkhart, but much larger, has also been built at Collinwood, Ohio, the past year. The necessity for adequate yard facilities at some point east of Chicago has been urgent for some time, and the new yard has relieved much of the congestion which occurred at transfer points near Chicago.

The new yard lies entirely on one side of the main passenger tracks. The general layout of the yards and the grade profiles are shown by the accompanying drawings. In studying these drawings it should be kept in mind that on the Lake Shore trains run left-handed. The general plan of these yards consists of receiving tracks and classification tracks for eastbound traffic and a similar set of tracks for westbound traffic. Between each receiving yard and classification yard is a hump track over which the cars are pushed in classification.

The general layout of the yard is divided into four parts in our engravings, the left-hand side of each engraving being a continuation of the right-hand side of the preceding engraving. The total length of the yard is nearly four miles. At station 5,140 (not shown in our engraving) is an interlocking plant. Eastbound freight trains leave the main track at this point and continue eastward along an east inbound freight track adjacent to the south main track. Between stations 5,185 and 5,190 the eastbound receiving yard begins, into which the train is pulled. The receiving yard consists of five tracks holding from 88 to 90 cars each. About the middle

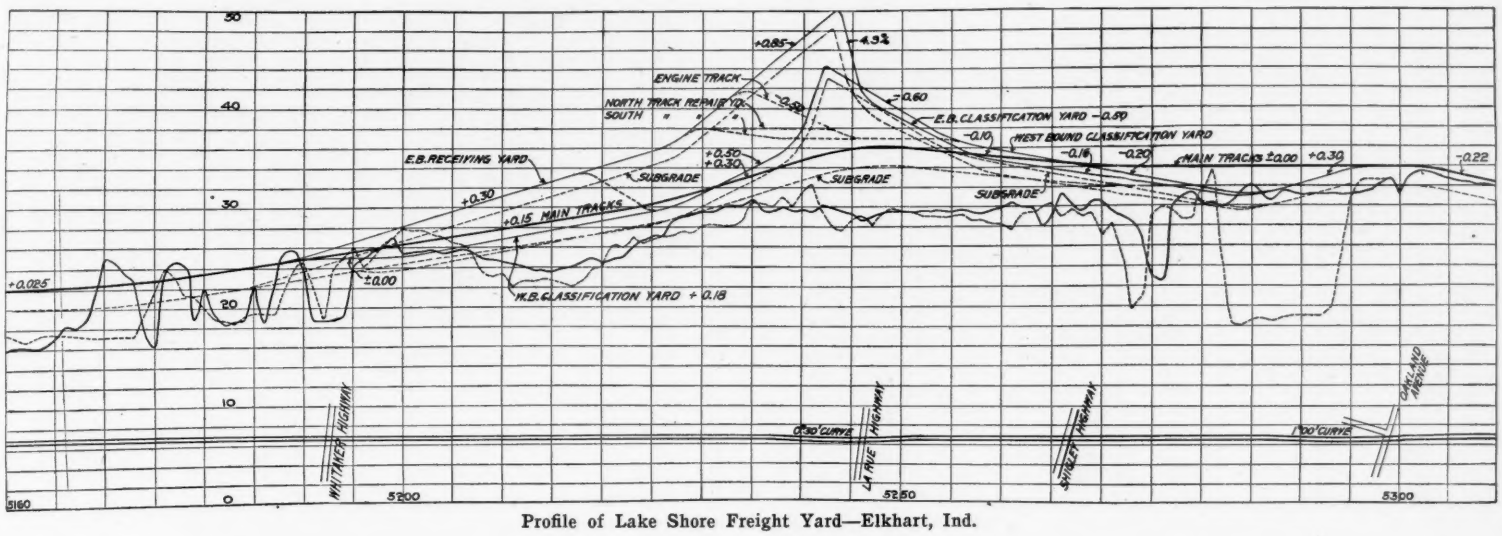






Lake Shore Freight Yard—Elkhart, Ind.

of the receiving yard is a series of crossovers. These permit of trains being divided up, so that each section can be handled separately. After the engine has pulled its train into the receiving yard the engine is uncoupled and passes eastward to the roundhouse, which is at present at about station 5,330, not shown in the engraving. The train is then classified by pushing the cars over the hump track into the eastbound classification yard, which holds about 836 cars with present tracks. The eastbound receiving yard has an ascending grade of .3 per cent., excepting near the hump, where the grade increases to .85 per cent. The grade, after leaving the summit of the hump, drops at the rate of 4.3 per cent. for a distance of about 300 ft., and then continues on into the classification yard on a descending grade of .6 per cent. through the switches. It will be noted that the hump track is quite long and that all the tracks in the eastbound classification yard have a descending grade of about .16 per cent. After



Profile of Lake Shore Freight Yard—Elkhart, Ind.

the trains are made up in the eastbound classification yard an eastbound engine backs down and pulls the train eastward out of the yard. The bad order track and the caboose track connect on to the hump track, as shown in the engraving. After a train is made up in the eastbound classification yard a switch engine gets a caboose from the caboose track and backs up to the hump track, and then pushes the caboose into the classification yard, where it is coupled on to the waiting train. Westbound traffic is similarly handled, the operations being easily traced by means of the references on the engravings. The switching track, which is shown between the east and westbound freight tracks at each end of the yard, is used either as a waiting track or for tail switching at the outlet of the classification yard. The repair yard is between the two hump tracks. The stock car track is used for holding stock cars while being cleaned out.

30-ft. Concrete-Steel Arch—Lake Shore Yards, Elkhart, Ind.

The dotted lines in the engraving show proposed extensions which are to be added from time to time as the traffic conditions require. A considerable amount of re-locating and filling in was required for the building of these yards. Part of the main track and a street railway track originally passed through the site now occupied by the yard. This road was re-located so as to keep entirely north of the new main passenger tracks. Nearly 700,000 cu. yds. of material was moved in building these yards. Three concrete-steel arch culverts were built over the La Rue highway, as shown between stations 5,245 and 5,250. A photograph of the culvert under the main passenger tracks is shown herewith. It is the intention to ultimately equip the yards with an automatic interlocking system, but at the present time the switches are thrown by hand.

The yards were designed in the office of Mr. E. A. Handy, Chief Engineer of the Lake Shore, and we are indebted to him for the plans and general details. The engineer in charge of the construction of this yard was Mr. H. H. Ross, of Mr. Handy's office.

Speed Tests of the De-Glehn Compound on the Great Western of England.

A recent number of *The Engineer*, of London, contains a detailed account, by Mr. Charles Rous-Marten, of the performance of the new 4-cylinder compound French engine, *La France*, on the Great Western of England. This engine was described in the *Railroad Gazette*, Nov. 27, 1903. The two high-pressure cylinders, 13⅜ in. in diameter, are placed outside the frames and are coupled to the rear pair of drivers. Two low-pressure cylinders 22 1/16 in. in diameter, are placed inside the frames under the smokebox, and drive the first pair of wheels through a crank axle. The calculated tractive effort is 28,814 lbs., and the working steam pressure is 227 lbs.

The first test recorded by Mr. Rous-Marten was on the Exeter non-stopping fast express, which is booked to make a run of a little over 193 miles in 3 hrs. 30 min., averaging 55.4 miles an hour, from start to stop inclusive. The total weight of the train behind the tender was 160 tons. The following is quoted from the article in *The Engineer*, and gives the details of this run:

"Ealing, 5¾ miles, was passed in 7 min. 48 sec. from the start, and Hayes, 11 miles, in 13 min. 1 sec. Almost immediately after passing Hayes we encountered the first of what was to prove a most irritating procession of delays, the order having been issued for slowing down near Dawley Box for re-laying. Nevertheless, we got through Slough, 18½ miles, in 19 min. 42 sec. from Paddington, our speed at that point being 73.8 miles an hour. Up the long, slight ascent at 1 in 1320 which extends practically from Slough to Sonning, *La France* maintained a persistently even rate of 70 to 71 miles an hour, which increased to 75 just before Reading. That station was passed in 35 min. 1 sec. from Paddington, and Didcot in 50 min. 18 sec., or 15 min. 17 sec. from Reading. A little later we experienced a second and far more serious hindrance, a goods train being on the road in front of us and bringing us to a dead stand at Milton Crossing, the distance of 56 miles from London having been run in 52 min. 39 sec. from start to stop. After a stay of 2 min. 1 sec., we proceeded on our way, soon attaining 67 miles an hour up the slightly steeper grades of 1 in 600 to 1 in 750, and we were doing 69 when the repairs still in progress at the Cricklade Bridge, just east of Swindon, and 77 miles from London, brought us down literally to slow walking pace—almost an absolute stop, the inclusive time from London being 74 min. 59 sec., the running time 72 min., 78 sec., the net time 69 min. From Swindon onward down the slightly falling grade we maintained much the same pace as we did during the previous ascent. The Wootton Bassett incline of 1 in 100 was descended without steam and the speed was not permitted to be so high as usual. Bath Station, 106 miles 70 chains, was passed dead slow in 104 min. 14 sec. inclusive from Paddington, or 102 min. 13 sec. actual traveling time, 97 min. net. At Saltford, between Bath and Bristol, we were again slackened to 15 miles an hour in consequence of a landslip caused by the previous heavy rains. At St. Anne's Park we were again checked by signal, but in spite of all these delays we breasted Templemeads Station, Bristol, in exactly 118½ min. from the London start; the traveling time was 116½ min.; the net time, allowing for delays, 109½ min. After getting on to the dead level near Yatton, *La France* attained the absolute maximum speed of the whole run, namely, 84.9 miles an hour. This would probably have been maintained for a considerable distance along the flat, but unluckily another signal check to 15 miles an hour was encountered at Huish Crossing, followed by yet one more between Worle and Uphill junctions. At Bridgwater we were again badly slowed, this time for bridge repairs. Notwithstanding all these impediments, Taunton, 163¼ miles, was passed 2 hrs. 45 min. 16 sec. from Paddington, but at Victory siding, a mile beyond Norton Fitzwarren, signals were yet again adverse, and brought us down to 20 miles an hour. This experience was repeated at Poole siding, about two miles further on, and at the advance starting signal west of Wellington Station we were stopped dead, just at the worst point of the Wellington bank, which thenceforward rises for nearly three miles at 1 in 90, 1 in 81, and even 1 in 80 to the Whiteball Tunnel. This afforded a somewhat severe test of *La France's* hill-climbing powers, but no difficulty whatever was experienced. She started afresh without the slightest slip, and gathered speed so rapidly up that steep grade, that when she entered the Whiteball Tunnel she had attained 48 miles an hour, and threaded the tunnel, which is on a rise of 1 in 126, in 61 seconds. A steady but only moderately-paced descent toward Exeter followed, and we were stopped dead by signal just at the entrance of Exeter Station, nearly 7 min. in front of booked time, having thus accomplished the run of 193½ miles from London in 3 hrs. 23 min. 14 sec. inclusive. The actual traveling time—that is to say, deducting the duration of our absolute detention at a dead stand—was 3 hrs. 19 min. 27 sec.; and the net time, after deducting delay caused by two extra startings and stoppings, and by ten slowings for signals, re-laying, or bridge repairs, was 3 hrs. 2½ min. Even after this final dead stop of 3 min. 21 sec. at the entrance to the station, we came to a stand inside in exactly 3 hrs. 28 min. from the Paddington start. But, of course, from the point of view of locomotive performance, the journey ended with the final signal stop at the entrance to the station."

It will be seen that the maximum speed attained was 84.9 miles an hour.

On the following day the same engine was put on the mid-day express from Exeter to London. The booked schedule for this train is 3 hrs. 20 min. for the 193¾ miles, without stop, giving an average speed of 54.5 miles an hour. In this case the load consisted of ten 8-wheel corridor coaches, including a dining car. The train was well filled and the total load behind the tender was estimated at 275 tons. This run was made without incident, the performance of the engine being very good. On level track the maximum speed reached was 60 miles an hour. In spite of several delays, the actual net time was 3 hrs. 17¾ min., or about 12 minutes ahead of the schedule time.

In regard to the possible performance of this locomotive, Mr. Rous-Marten says:

"It will be observed that in these two trips the French engine was never really "extended." The aim kept in view was not to "break records," or get in long before booked time, but to keep time by maintaining as nearly as feasible a generally uniform rate, merely picking up by a slight degree of acceleration any time that might be casually dropped by the way. Her capabilities in this respect were put to a somewhat unexpectedly severe test by the delays of the down journey. It will be noticed, however, that the engine not only recovered every lost minute, but stopped at the entrance to Exeter Station 7 minutes before time, having made up no less than 20¾ minutes. On the up journey there were no stops, but seven separate slowdowns involving a total delay of 11 minutes. On the other hand, the load was 275 tons instead of 160. But it was never practicable to "extend" the engine, because from the outset she was well in front of the booked time, and so nothing was to be gained from "pushing" her, while, on the other hand, there was a moral certainty that to do so simply meant overtaking trains ahead, and so being checked or stopped by signal, as was the case on the down journey, when, in addition to the four permanent-way slowings, there were six slacks and three dead stops for signals."

As is well known, the Pennsylvania has ordered a similar type engine from France which will be tested at St. Louis and then placed in regular service. It will be interesting, therefore, to know what can be done with this engine under the severe requirements of American service.

The Austrian Railroad Ministry is preparing four dioramas, illustrating the wonderful mountain railroads in the Austrian Alps, for the St. Louis Exposition.

Committee Report on Yards and Terminals.*

After a brief history of the development of yards and terminals the committee gives definitions of the various types of coal piers, mentioning the general features applicable to all types, and general remarks are made on the selection of the type of pier to be employed and the arrangement of tracks leading to the pier. In most cases where inclined planes have been used the room ahead of the pier is so limited that a locomotive incline for the shore end could not be considered. An inclined plane is, however, an economical arrangement where the tracks ahead of the pier can be arranged so as to feed the cars by gravity to the plane, thus dispensing with the services of a locomotive. Where this arrangement is not possible and a locomotive is required to feed the cars to the plane it is more economical to let the locomotive place the cars on the upper deck, if room is available. In all cases track should be arranged to make the least number of shifting operations in the yard. Usually a large number of short tracks are required to sort cars for the different sizes and kinds of coal. Hence, when this is the case, the loaded car yard should consist of a number of short tracks or a gridiron arrangement with a ladder at each end. For the empty car yard usually a few long tracks will suffice, as no sorting is necessary. In all cases where steep locomotive inclines are used a long track should be provided, so that the train can get up speed to overcome the grade of the incline. Where the loaded car yard is at such a height that cars can be run on the upper deck of the pier by gravity, the loaded car yard can lead directly on the pier.

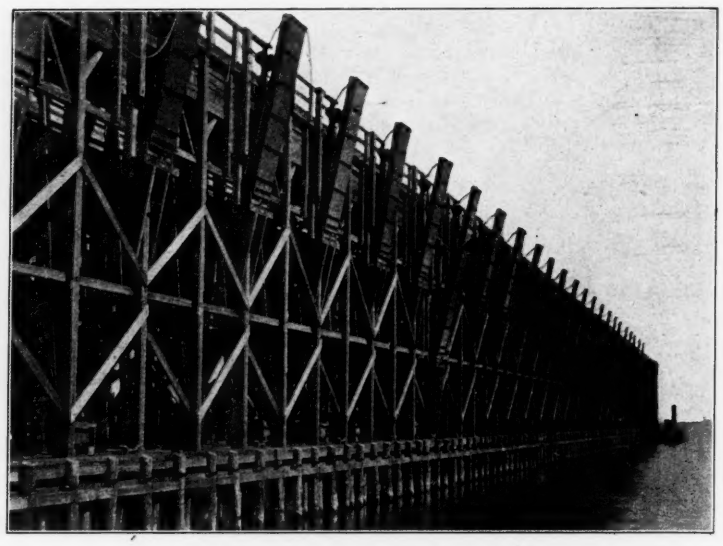
The committee submits illustrations and descriptions of certain typical piers operated on different systems. The coal pier of the Baltimore & Ohio at Curtis Bay, Baltimore, is shown as an example of a coal pier with gravity chutes. This pier was opened for business on September 24, 1900. It is 800 ft. long from shore line to deep water terminus, 60 ft. wide, and 45 ft. high, and its operations are almost automatic.

The loaded car approach is 1,000 ft. long and rises gradually on a grade of 1½ per cent. to the top of the pier. At the summit the cars run over a 100-ton Fairbanks track scale and are automatically weighed. As cars can be unloaded on both sides simultaneously, each track has its set of scales. After the weighing the cars run to the unloading pockets. These are made of steel, each ending in a long steel spout, which is dropped to the vessel's hatchway. There are 25 of these pockets and spouts on each side of the pier, two being assigned for anthracite coal.

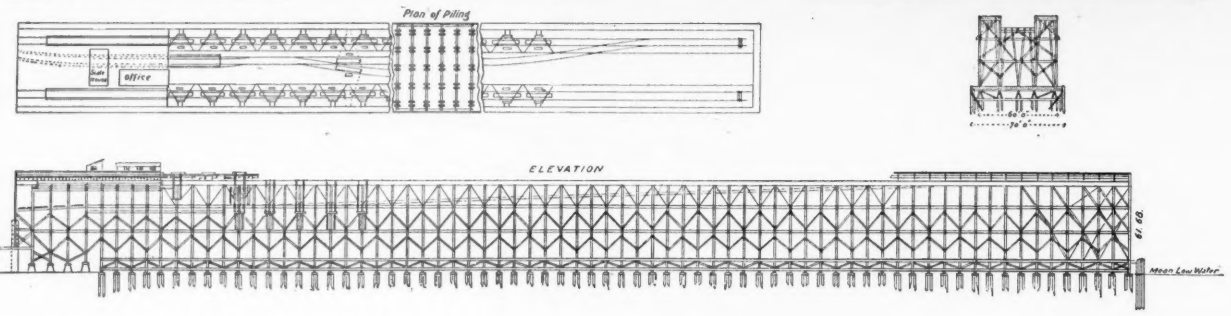
When the drop bottoms of the cars are opened and the coal has been dropped, the cars run by their own momentum to the "switchback" at the end of the pier. Here they reach the return track and run down an incline of 1,800 ft. to the yard, being weighed on a third pair of automatic scales while moving. With the use of 50-ton steel cars and a requisite amount of vessel tonnage, the maximum capacity of the pier will be approximately 1,000 tons per hour. The superstructure of the pier provides possible arrangement for storage pockets, of which 100 can be erected, nolding from 180 to 350 tons each.

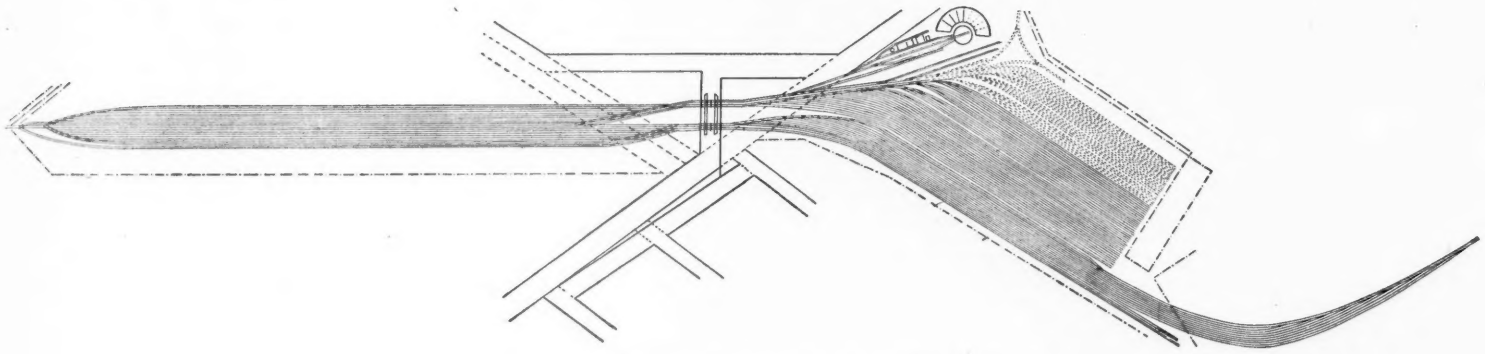
The coal pier is built in a most substantial manner of Georgia pine, and some 8,000,000 ft. of lumber was used in its construction. A channel 300 ft. wide and 30 ft. deep has been constructed from the entrance of the bay to the shore line of the pier, so that any vessel which can navigate Chesapeake Bay can load at this pier.

height to base of rail is 43 ft. 4 in. at mean low water and 49 ft. 4 in. at mean high water. There are now 31 chutes on the pier, five having been added since the pier was erected. The grade on the pier is 1¼ per cent., and on the approach it is about the same. The pier has a single deck on which four tracks are laid, all of which are used as return tracks, with switches so arranged that light cars are shifted to the two middle tracks near the shore end of the trestle. The arrangement of switches also permits cars to be run around other cars standing over chutes at either berth. There is a smaller pier at the same place, with the return track in the center, and depressed. Each type has its advantages, depending upon the height of the yard above water, the available distance from approaches, character and volume of traffic, etc.

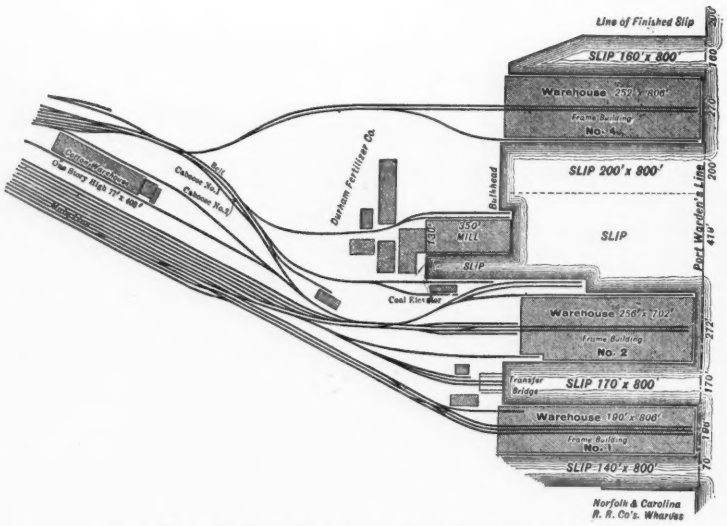


Baltimore & Ohio Coal Wharf at Curtis Bay.

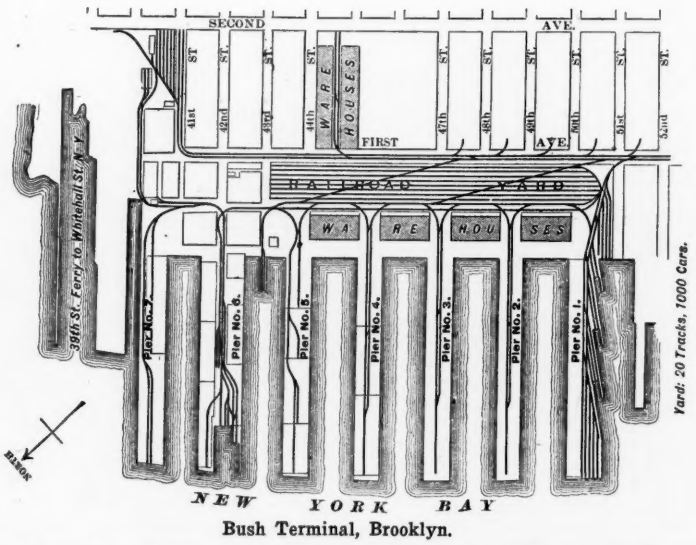




Baltimore & Ohio Curtis Bay Yard and Coal Wharf.



Pinner's Point Terminal of the Southern.



Bush Terminal, Brooklyn.

COAL PIER OF THE PHILADELPHIA & READING AT PORT RICHMOND (PHILADELPHIA, PA.).

Pier No. 11 was built in 1898, and has proved very satisfactory. It is 761 ft. long, measured on the wharf log, and the length of trestle is 878 ft. 6 in.; the width is 61 ft. on the wharf log and 55 ft. on the deck. The depth of water, at mean low water, is from 22 ft. at the shore end to 26 ft. at the river end of the pier. The

COAL PIER OF THE PENNSYLVANIA RAILROAD AT GREENWICH POINT (PHILADELPHIA, PA.).

The new pier, No. 6, which was built in 1902, is 735 ft. 2 in. long, with a width of 50 ft. at the outer end and

*Presented at the convention of the American Railway Engineering and Maintenance of Way Association, March, 1904.

60 ft. at the shore end. Its height from water line to rail is 65 ft. at the shore end and 57 ft. 6 in. at the outer end. The depth of water at the pier is 30 ft. The approach has three tracks on a down grade of 1 per cent. to the foot of a cable incline of 17.5 per cent. The pier has two tracks. The delivery track runs to the outer end of the pier on a grade of 1 per cent.; the return track has a grade of 2.8 per cent. on the pier and 1.5 per cent. beyond the pier. The pier has 40 pockets and chutes, 20 on each side, and the maximum capacity of delivery to vessels is 1,500 tons per hour. Loaded cars are run by gravity from the yard to the foot of the incline, up which they are hauled by a stationary engine and cable. They are then run or "spotted" by gravity to position for unloading. The empty cars run by gravity to the outer end of the pier, and then run by gravity down the return track to the surface of the ground, at about 1,000 ft. from the shore end of the pier.

COAL PIER OF THE NORFOLK & WESTERN RY. AT LAMBERT'S POINT, VA.

This pier is of class B-2, having an incline operated by cable and "barney."

The boiler house contains three Geary water tube boilers, rated at 545 h. p. These were furnished by the Oil City Boiler Works, Oil City, Pa. The hoisting engines are two in number, one being for emergency. They were built by the Lidgerwood Manufacturing Company, of New York, and each is capable of a straight pull on a single line of 50,000 pounds at 400 lineal ft. per minute. The hoisting cable passes over a 72-in. steel sheave at the top of pier. This cable is 1½ in. in diameter, of plow steel; length, 700 ft. The "barney" car is hauled down by 80 ft. of ½-in. steel tail rope. This car was built by the Lidgerwood Manufacturing Company on plans approved by the railway company's engineers. On the pier are three 100-ton automatic scales, with the Amet weighing device. The scales were furnished by the Fairbanks Co., of Baltimore.

The device for hoisting the chutes is the pattern known as the Denton counterbalance hoist, manufactured by Pettibone, Mulliken & Co., of Chicago. The American Bridge Company, of New York, built this pier, while the piling and bulkhead, and approaches thereto, were built by John P. Pettyjohn & Co., of Lynchburg, Va.

A description of the Norfolk & Western coal piers at Lambert's Point, reprinted from the *Railroad Gazette*, July 24, 1903, is next given.

Notable railroad coal piers are listed and classified in the following table:

When the car has been dumped the cradle is lowered, and the car is pushed off by the next loaded car entering.

The machine is usually operated by steam power, and two steam winches are placed on the pier or dock for moving the vessel so that the different hatches will come under the chute. It is designed for handling either anthracite or bituminous coal, and provision may be made in the apron for screening the coal. The machine will handle all sizes of cars found in the coal trade (without any alterations), and will deliver coal into all kinds of vessels. When working under favorable conditions the machine can handle 30 cars, or 1,000 tons per hour, and this rate has been attained with the machine of the Cincinnati, Hamilton & Dayton at Toledo. The force required is given as follows: One man to operate the cradle and apron, 1 to operate the telescopic chute, 1 to operate the car handling machinery, 1 fireman, and 1 oiler.

In the Brown machine the cars are elevated and tilted sideways to discharge their contents, but the car is not raised to a great height and the coal is not delivered in. In some cases cars can also be fed into the machine by gravity.

As soon as the cradle is clear of the tubs, the car on which they are mounted is hauled away and its place is taken by another car with six empty tubs. Running over the machine, on a runaway parallel with the face of the pier, are two overhead steam traveling cranes, having a speed of 600 ft. per minute. These have projecting girders extending beyond the face of the pier, but capable of being moved in and out, so as to clear the masts of vessels. These cranes, which are operated independently of the rest of the machine, take the loaded tubs, one by one, and carry them to a point opposite the proper hatch of the vessel, where they are run out on the girders and lowered into the hold. On touching the bottom of the ship or the top of the coal pile, the doors of the tub are released and the coal rolls out as the tub is hoisted out of the hold again. The crane operator then returns the tub to its car and takes the next tub, until all the tubs have been emptied. The machine operator then returns it to the dumping machine to have the tubs loaded again. The crane operator can dump the tubs in the center of the hatch, or at either side, and can carry the tub to any of the hatches, and can thus keep the vessel in proper trim all the time it is being loaded.

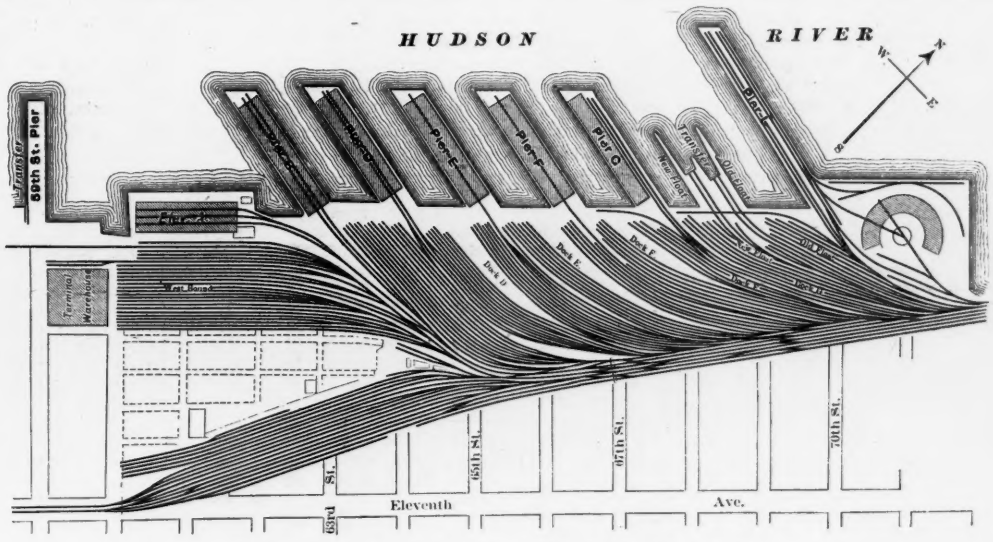
The two cranes can handle 5,000 tons in ten hours, and the car-dumping machine can handle twice this amount, so that by the use of four cranes the plant would have a capacity of 10,000 tons in ten hours. In 1903 one of the machines at Toledo, with two cranes, loaded 6,300 tons into a vessel in ten hours.

The Wellman-Seaver-Morgan Company has for the last two or three years been building car-dumping machines almost exclusively for inland furnaces for iron ore, but has built one machine for handling coal. It is situated on the Buffalo, Rochester & Pittsburg dock at Buffalo. On this dock the coal to be handled was of such a nature that it was very essential to reduce the breakage to a minimum. For this reason the machine was built with large conveyor buckets, which carry the coal from the machine and lower it to the bottom of the hatch before dumping. Ordinarily, where it is not desired to look after the breakage so carefully, the machines are built with a chute, which conveys the coal from the machine direct to the boat.

The buckets are designed with a movable bottom, and when in position for receiving coal from the car dumper the bottom is close to the top of the bucket. As the bucket is filled the bottom gradually lowers so that the coal does not drop at all. After the bucket is filled it is conveyed over the hatch and lowered to the bottom of the boat, where the top part of the bucket is drawn away from the bottom, allowing the coal to flow out without any breakage. Two buckets only are used, their combined capacity being ample for any coal cars now in use.

The car dumper proper is very similar to the McMyler machine and was invented by Mr. G. H. Hulett. The loaded cars are run into the machine by a barney car, which disappears in a pit and allows the loaded cars to pass over and in front of it, when by a haulage engine it is pulled out and pushes the loaded car on to the platform of the car dumper. The car is automatically clamped to position on the platform by means of counterweights, which are hung on chains at the back side of the machine, the chains running through the machine and over the car. The weights are graduated so as to give a pressure sufficient to hold the car in an inverted position without putting an undue crushing strain on the sides of the car. The tracks which are provided for the car on the platform are arranged on a moving table, and the first motion of the car as it starts to invert is sideways, until the side of the car rests against the steel plates forming the side and chute of the cradle.

The machinery for controlling the tipple and conveyors is mounted on top of the machine. One operator is required for the tipple and barney car, one for each of the buckets, and a fireman. This car machine has handled 26 cars per hour, which is practically the same speed as the machines which dump directly into the boat. The result in regard to breakage has been found very satisfactory. The front end of the conveyors is made mov-



New York Central Piers, 60th to 70th Streets, New York.

RAILROAD COAL PIERS.

Railroad and location.	Date when built.	Size, ft.	Method of elevating cars.	Approach. Grade, per cent.	Gr of delivery tracks. No tracks.	Gr of delivery tracks. On pier, per cent.	Gr. of return tracks. On pier, per cent.	Gr. of return tracks. Beyond pier, per cent.	Height. Shore end, ft.	Height. Sea end, ft.	No. tracks on upper deck.	No. return tracks.
N. Y., O. & W., Cornwall, N. Y.	1892	About 50x700	Inclined plane Sea end	..	1	..	..	..	..	..	4	2
P. R. R., No. 5, Greenwich Pt., Phila.	1888	56x650	Loco. incline. Shore end	About 2.	1	0.3	0.3	2.0	28.	30.	4	2
P. R. R., No. 6, Greenwich Pt., Phila.	1902	735x50—60	Cable incline Sea end	17.5	3	1.	2.8	1.5	65.	57.5	2	1
N. Y., S. & W., Cliffside, N. J.	1893	65x957	Inclined plane	20.	2	0.87 & 1.22	2.08	..	31.7	25.	4	1
P. & R., Port Richmond, Philadelphia	1893	About 54x700	Loco. incline.	2.95	2	1.39	1.39	..	..	About 23.	..	..
P. & R., Port Richmond, Philadelphia	1898	55x761	Loco. incline.	1.25	..	1.25	..	..	43.4	..	4	..
P. & R., Port Reading, N. J.	1891	56 wide	Loco. incline.	3.	2	1.33	3.	..	36.	19.	4	2
N. & W., Lambert's Point, Va.	1890	About 50x805	Loco. incline.	2.5	1	0.732	2.5	1.0	42.	35.	2	1
N. & W., Lambert's Point, Va.	1902	56x850	Inclined plane	25.	2	0.667	2.833	2.833	72.8	74.6	2	1
D., L. & W., Pier No. 10, Hoboken, N. J.	1884	64x995	Inclined plane	16.	2	1.0	0.8	..	35.	25.	4	1
D., L. & W., Hoboken	1903	1283x60—72	Gravity	1.	..	level	1.	1.	4.5	4.5	..	2
C. R. R. of N. J., Jersey City, N. J.	1887	38 wide	Loco. incline.	2.64	2	1.46 1.38	3.	..	29.	20.6	2	1
D. & H., Weehawken, N. J.	1887	.....	Inclined plane	17.5	1	1.04	1.74	..	35.	..	4	1
B. & O., St. George, S. I.	1892	About 300 long	Loco. incline.	..	1	level	..	..	..	..	..	..
B. & O., Philadelphia, Pa.	1893	40x700	Loco. incline.	2.	2	level	..	..	18.5	18.5	2	1
B. & O., Curtis Bay, Baltimore	1900	800x60	Loco. incline.	1.5	2	1.5 0.87	2.5	—1.	45.	45.	2	2
Erie, Weehawken, N. J.	1891	.....	Inclined plane	20.	2	1.22	1.4	..	36.	26.5	4	1
L. V. R. R., Pier A, Perth Amboy, N. J.	1886	70x800 44 wide	Gravity	0.6	4	0.6 0.9	1.0	..	29.5	25.	4	1
C. & O., Newport News, Va.	1882	275 long	Loco. incline.	2.03	2	0.6	0.6	..	..	22.	2	1

Taking up the subject of machines to dump coal with minimum breakage, the McMyler, Brown, and Wellman-Seaver-Morgan machines are described. With the McMyler machine, the operation is as follows: The loaded car is placed in the yard and moved to a point near the machine; this is usually done by gravity, but sometimes by an endless rope haulage system. The car is then hauled up the incline into the machine by means of a haulage engine. It is automatically clamped, hoisted to any desired height, and turned over sideways, delivering its contents into an inclined triangular apron, the car being at the base of the triangle. The apron is adjustable as to height, to suit different vessels, and from its apex the coal runs through a vertical chute into the hold of the vessel. The coal simply slides down the apron, and as the chute is quite full the coal has no drop, but flows down in an unbroken stream. The chute is telescopic, so as to be adjusted to any height of the apron or any depth of hold. It is also pivoted, so that coal can be delivered at the sides as well as at the middle of the hold. The apron will hold 70 tons of coal, or two carloads, directly into the hold of the vessel. The tilting cradle is mounted in a steel house or tower and the operations of the machine are as follows:

When the cradle is in its lowest and normal position, a loaded car is pushed into it by a pushing device ("a barney" or "ground-hog"), which lies in a pit between the track rails, when not in use, and is operated by a cable. When in the cradle the car is clamped by means of hydraulic clamping bars. The engine is then started and the cradle is slowly revolved sideways until the car is upside down. During this movement the coal has rolled, rather than fallen, from the car into six hoppers attached to the cradle, and each hopper has entered a transfer tub, or car, the six tubs standing on a flat car alongside the cradle. The hoppers have bottom doors, which are automatically released on touching the bottoms of the tubs. The cradle is then returned to its normal position, leaving the coal in the tubs, where it has been deposited quietly and without falling, so that there is practically no breakage. The empty car is then run out of the machine by gravity and another loaded car pulled

able so that the two booms when extended over the boat may be placed over two adjacent hatches. These hatches are usually 24 ft. centers. The total cost of running these machines, including shifting of cars, fuel, operators and maintenance, has been found to be from $550 to $600 per month. In ordinary use about 4,500 tons of coal are dumped over the machine during ten hours.

ORE PIERS.

The committee also discusses ore piers, and finds the ore-loading piers of the lake ports in general similar to coal-loading piers. They consist essentially of long timber piers, extending out from the shore, with tracks along the top, on which the drop-bottom ore cars are run, discharging their contents through the floor into pockets. Hinged chutes from these pockets deliver the ore by gravity to the hatchways of the vessels lying at the pier. The following table classifies existing ore piers:

IRON ORE SHIPPING PIERS ON THE GREAT LAKES.

Railroad and Location.	Pier No.	No. of pockets.	Storage capacity, tons.	Length of pier, ft.	Height from water to Hinge of chute, ft.	in.	Deck, ft.	in.	Width over partition posts, ft.	in.	Length of spouts, ft.	in.	Angle of pockets, deg.	min.
Chicago & North Western, Escanaba, Mich.	1	184	24,104	1,104	28	10	48	6	37	0	21	0	39	30
" " "	3	220	30,284	1,356	31	2	52	8	37	0	27	0	45	0
" " "	4	250	32,750	1,500	36	6	59	2	37	0	30	0	45	0
" " "	5	232	43,152	1,392	28	6	53	3	37	0	21	8	40	0
" " "	6	320	58,000	1,920	40	0	70	0	50	2	30	0	45	0
" " Ashland, Wis.	1	234	36,036	1,404	32	10	54	0	46	8	27	0	39	30
" " "	2	234	25,740	1,404	36	6	57	8	46	0	27	0	42	0
Total	..	...	250,066											
Duluth & Iron Range, Two Harbors, Minn.	1	202*	40,400	1,388	35	5	59	6	49	0	27	0	38	42
" " " "	2	208	41,600	1,280	33	5	57	6	49	0	27	0	38	42
" " " "	3	90	16,200	572	28	10	52	0	49	0	25	0	38	42
" " " "	4	168	36,960	1,112	37	0	62	0	49	0	29	0	38	42
" " " "	5	168	33,600	1,112	30	0	54	6	49	0	25	0	38	42
Total	..	...	168,760											
Duluth, Missabe & Northern, Duluth, Minn.	1	384	57,600	2,336	30	0	53	0	49	0	27	9	45	0
" " " "	2	384	69,120	2,336	32	0	57	6	49	0	27	9	45	0
" " " "	3	192	40,320	1,152	40	7	67	0½	59	0	27	9	45	0
Total	..	...	167,040											
Duluth, South Shore & Atlantic, Marquette, Mich.	1	270	27,000	1,700	25	0	45	0	40	0	20	4	39	0
" " " "	4	200	28,000	1,200	27	9	47	3	36	8	21	1	39	45
Total.	..	...	55,000											
Lake Superior & Ishpeming, Marquette, Mich.	1	200	36,000	1,232	30	9	54	0	50	0	24	7	38	40
Great Northern, Superior, Wis.	1	250	40,500	1,525	32	0	57	0	49	8	27	2	45	0
" "	2	350	87,500	2,100	40	0	73	0	62	8	32	4	45	0
" "	3	160	40,000	960	40	0	73	0	62	8	32	4	45	0
Total	..	...	168,000											
Minn., St. Paul & S. S. Marie, Gladstone, Mich.	1	120	15,000	768	26	8	47	0	37	0	21	8	40	0
Wisconsin Central, Ashland, Wis.	1	314	48,356	1,908	40	0	66	2	36	0	27	0	50	45
Chicago, Milwaukee & St. Paul, Escanaba, Mich.	1	240	50,400	1,500	40	2¾	66	6	52	0	27&29†		45	0
Algoma Central & Hudson Bay, Michipicoten, Ont.	1	12	.....	312	34	0	43	4	25	0	22	6	41	0

*No. 1 Pier, D. & I. R. Railroad, has double pockets for 1,076 ft., and single pockets for 312 ft.
†The pier of the C., M. & St. P. Ry. has 120 spouts 27 ft., and 120 spouts 29 ft. long.

The committee sums up its investigations in the following conclusions:

(1) Piers.—At rail-and-water terminals, the piers should be designed with a view to the most efficient, rapid and economical handling of the business, and with a view also to the future development of this business. Care must be taken to give due weight to the special conditions and features of location, traffic, etc., which exist in every case, and which render it impossible to lay down any but the most general rules for such piers. In every individual case, the length, width, number of tracks, width of platforms, details of construction, and width of waterway between adjacent piers, must be adjusted to best meet conditions as to shape and area of site, as well as its relation to its approaches from both land and water, and the character and volume of the business to be handled.

(2) Covered Lighterage Pier.—When conditions will permit, good practice will generally suggest a length of approximately 600 ft., with two depressed tracks. If the business to be handled over the pier is expected to move quickly the width should be no greater than is necessary to provide temporary storage and shelter for the goods during ordinary detentions while waiting for cars or lighters, preferably about 100 ft. If the movement is expected to be slow and it is necessary to provide storage while waiting for cars or vessels, or for assorting, classifying, inspecting or sale of goods, the width should be increased, but preferably not beyond a width of 125 to 150 ft. If the movement is not expected to have a special character, or a mixed business is to be provided for, a compromise width of 125 ft is suggested. The space between the shed and the outer edge of the pier should be not less than two feet, and the clear width of waterway between piers should be, if possible, not less than four times the width of the largest vessels to be handled.

(3) Open Lighterage Pier.—This should, if possible, have a length of about 600 ft., and the width, number of tracks and the appliances for handling traffic should be adjusted to the particular use to which the pier is to be applied.

For ordinary coarse freight in bulk, such as iron ore, stone, timber and similar products, the width should be from 50 to 80 ft., and there should be four tracks, with crossovers, to facilitate the handling of cars and avoid delay in transferring to or from vessels. If the business is light, or is principally heavy or costly products, such as cut stone, machinery, or miscellaneous freight not requiring shelter, a narrow pier of about 35 ft. in width, with two tracks only, is suggested.

(4) Export and Storage Pier.—This should be designed with special reference to the character of the commodities to be handled, whether quick movement is expected or the goods are to be held some time in storage for the accumulation of full cargoes, or for inspection or classification. If the conditions and volume and character of the business warrant there should be two floors, with two or three depressed tracks on each, these tracks to be connected by crossovers at convenient intervals to facilitate the movement of cars. The length should be sufficient to properly accommodate either one or two vessels on each side at the same time, or approximately 600 to 1,400 ft. The width must be determined by the space available and the business to be handled. If quick moving, a width of 125 to 150 ft. is recommended. If slow moving, and large accumulations must be received and stored, the width may be extended, if space permits, to 300, or even 400, ft.; but excessive width is not recommended on account of the consequent increase in cost of handling. The space between shed and face of pier should not be less than three, or more than six, feet, and the clear waterway between piers should be, if possible, not less than four times the width of the largest vessels to be handled.

(5) Coal Pier.—This should be an open pier, and where coal is to be delivered to vessels through pockets and chutes, in the ordinary way, the pier should be high enough to allow coal from drop-bottom cars to be loaded by gravity into vessels or barges. It should have three or more tracks, the outside tracks for loaded cars and the inside one on an incline to return the empty cars to the yard by gravity. The length depends upon the grade necessary to reach the desired elevation, the length of the vessels to be coaled and the number of cars which it is desired to unload at one time. Adjacent piers should be sufficiently distant to accommodate the class of service, which will depend on the length of the pier and the size of the water craft to be accommodated. Where coal cars are dumped by machinery which elevates and tilts the cars, a high pier is not necessary, and it may be at any convenient height.

(6) Station Pier and Team Track Delivery.—A city station pier served by car floats should be approximately 600 ft. long and 125 ft. wide, with a 35-ft. depressed driveway in the center. It should be a closed pier, with 3-ft. platform outside. Adjacent parallel piers should be, if possible, 200 ft. apart in the clear. Along the water street should be a bulkhead, approximately 50 ft. wide, with two-story building, the upper floor being for offices, fruit auction room, etc.

(7) Grain Elevators.—These should be so located that cars can be run into them and unloaded, the tracks being so located that cars will feed to and from the proper part of the cluster or general yard without interference with other movements. Where possible, the tracks should be arranged to feed cars in at one end and out at the other.

The report is signed by the following committee:

W. G. Besler, Chairman; Vice-President and General Manager, Central Railroad of New Jersey, New York.

E. E. R. Tratman, Vice-Chairman; Resident Editor, *Engineering News*, Chicago, Ill.

J. A. Atwood, Chief Engineer, Pittsburg & Lake Erie, Pittsburg, Pa.

M. S. Blaiklock, Superintendent, Grand Trunk Ry., Montreal, Canada.

E. P. Dawley, Assistant Chief Engineer, N. Y., N. H. & H., Boston, Mass.

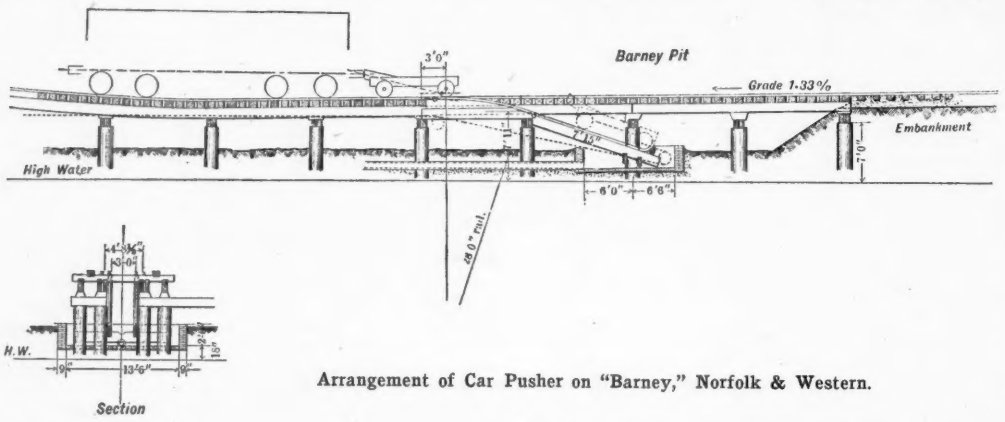
C. F. W. Felt, Chief Engineer, G., C. & S. F., Galveston, Texas.

F. O. Melcher, Superintendent, Ill. Div., C., R. I. & P., Chicago, Ill.

G. F. Morse, Assistant Engineer, Muskogee Union Ry., Muskogee, Ind. T.

C. S. Sims, General Manager, Baltimore & Ohio, Baltimore, Md.

F. S. Stevens, Superintendent, Philadelphia & Reading Ry., Reading, Pa.



Arrangement of Car Pusher on "Barney," Norfolk & Western.

Northern Securities Company.

The principal incidents leading up to the organization of this company and its subsequent history are as follows:

May 9, 1901—Northern Pacific corner, being an attempt of Harriman interests to secure control of the Northern Pacific.

November 13, 1901—Formation of Northern Securities Co. under New Jersey charter to guard the Northern lines against any repetition of such an attempt as that of May 9. Northern Pacific stock taken in at 115 and Great Northern at 180, in the stock of the new company.

Authorized capital stock $400,000,000, of which about $365,000,000 has been issued in return for about 99 per cent. of Northern Pacific and 75 per cent. of Great Northern.

February 1, 1902—Paid first dividend of 1 per cent. quarterly. The dividend has since been increased to 1⅛ per cent. quarterly.

February 19, 1902—Attorney-General Knox announced that he had been instructed to bring suit against the company for the Government, on the ground that the company was in violation of the Sherman anti-trust law.

April 9, 1903—Circuit Court of Appeals at St. Paul unanimously declared the company a combination in restraint of trade under the Sherman law. Appeal was taken shortly, and a stay of proceedings was granted allowing the constituent companies and the Northern Securities Co. to declare and pay their regular dividends pending final decision by the Supreme Court.

September 3, 1903—Judge Lochren rendered decision in case of State of Minnesota vs. Northern Securities, to the effect that the company was not in violation of State laws. The decision was appealed to Supreme Court, and the question of jurisdiction of that court was discussed in January, 1904.

December 14, 1903—Hearing in the appeal of the company from the Circuit Court decision of April 3, began at Washington.

March 14, 1904—Affirmation of the April 9, 1903, decision, made by the Supreme Court of the United States. Justices Harlan, Brown, McKenna, Day and Brewer affirming, and Justices Fuller, Peckham, White and Holmes dissenting.

The *Wall Street Journal* summarizes the financial results to the stockholders of the company, which is to be dismembered, as follows:

The assets underlying the $365,000,000 odd of Northern Securities stock consist of stocks of Northern Pacific

and Great Northern, about $5,000,000 of other securities and a considerable amount of cash.

If the stockholders are entitled to a pro rata distribution of these assets, each stockholder is entitled to his share of Northern Pacific stock, reckoned at 115, Great Northern, reckoned at 180, and other assets, which total over $6,000,000.

Each share would receive about 2 per cent. from the "other investments" and cash. Taking 85 as the cost of a share, for that amount the purchaser would receive, under the method of distribution, his proportionate share of Northern Pacific, of Great Northern, and 2 per cent. from "other assets."

If direct refunding were ordered the holder of 115 shares of Northern Securities issued for Northern Pacific would receive 100 shares of Northern Pacific and about 2 per cent. from "other assets."

The holder of 180 shares issued for Great Northern would receive 100 shares of Great Northern and 2 per cent. from "other assets."

Hardening and Tempering Steel.*

When pure iron is heated it undergoes two changes, one at about 730 deg. C, and the other at about 870 deg. C. At 730 deg. C it loses its power of being attracted by a magnet, and at 870 deg. C it gains the power of absorbing carbon. For convenience the three forms of iron have been given distinctive names. The form that exists below 730 deg. C is called *a iron;* it is attracted by a magnet and does not absorb carbon.† Between 730 deg. C and 870 deg. C it is called *b iron;* it is not attracted by a magnet and does not absorb carbon. Above 870 deg. C it is called *j iron;* it is not attracted by a magnet and it absorbs carbon.

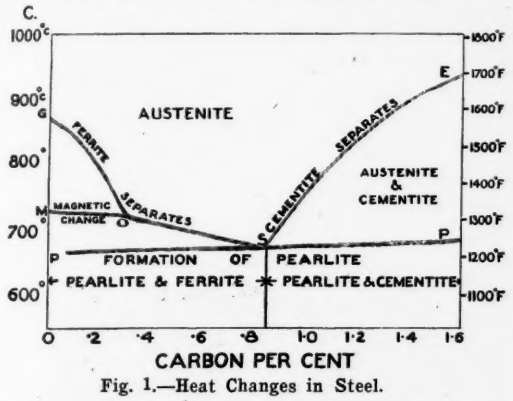


Fig. 1.—Heat Changes in Steel.

These changes are indicated by the points C and M in Fig. 1, in which the horizontal distances denote steels with different percentages of carbon, and the vertical distances in the diagram show the temperatures at which these changes take place in each variety of steel. These lines are obtained by slowly heating or cooling a piece of steel with a thermo couple pyrometer attached to it. Each change in the steel produces a small absorption or evolution of heat, and this is recorded by the instrument. A number of steels having different amounts of carbon are tested in this way, and the results when

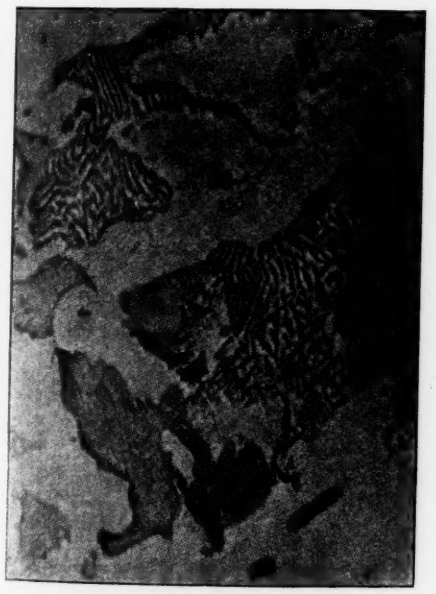


Fig. 2.—Steel With 0.45 Per Cent. Carbon.
(*Annealed.*)

plotted give the diagram in Fig. 1. The temperatures of the change points are lowered by the addition of carbon to the iron, just as the freezing temperature of water is lowered by the addition of salt. This lowering is indicated by the lines G O S and P S. In steel of any percentage of carbon a portion of the change takes place at about 670 deg. C as indicated by the line P S P and in the steel containing about 0.8 per cent. or 0.9 per cent. carbon the whole of these changes take place at this temperature.

The lines in the figure show the temperatures for these changes during cooling; the change in heating takes place a little above the temperatures indicated. If a piece of steel containing 0.8 per cent. of carbon is heated to a yellow heat, it will no longer attract a magnetic needle. As it cools down to a dull red heat the needle is once more attracted and a moment later the second change occurs and produces so much heat that, in a darkened room, the steel can be seen to become brighter for a moment. These are the changes that occur on the lines O S and P S in the figure.

Above the lines G O S E all the carbon in steel tends to spread uniformly throughout, the steel forming a solid solution; by quenching the steel the carbon is retained in this condition and the steel is hard. If the steel were allowed to cool slowly from a red heat it would be soft. In this case the carbon has time to separate from the iron during the slow cooling. The particles of separated

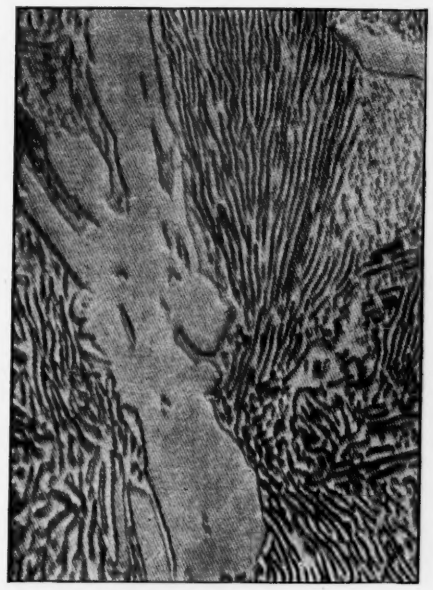


Fig. 3.—Steel With 1.5 Per Cent. Carbon.
(*Annealed.*)

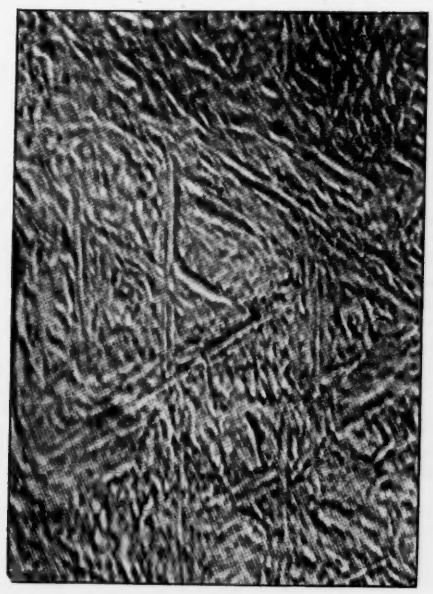


Fig. 4.—Steel With 0.45 Per Cent. Carbon.
(*Quenched.*)

iron are soft like wrought iron, but a certain amount of hardness is produced by the carbon which assists as particles of a chemical compound Fe_3C, mixed mechanically with the particles of iron. This compound, which is known as cementite, is harder than glass, but the presence of the soft iron prevents the steel as a whole from being particularly hard.

Thus steel is hardened by heating it above the lines G O S E in Fig. 1, keeping it there until it has had time to dissolve most or all of the carbon and then cooling it quickly by quenching so that the carbon may not have time to separate again during the cooling. The hardened steel can be tempered by re-heating to a temperature of 200 deg. or 300 deg. C in order that some changes may take place which were prevented by the sudden cooling. The hotter the steel is made the more these changes are able to take place and the less hard the steel will be. If the steel were heated to a red heat the changes would take place completely and the steel would be quite soft. The temperature to which the steel should be raised in tempering is usually judged by the color of the thin films of oxide that form on a bright surface. These being darker in color as the steel becomes hotter. In one method of hardening and tempering only the end of the tool is hardened by quenching and sufficient heat remains in the other part of the tool to affect the tempering without reheating. The end of the tool being brightened after quenching, one is able to observe when sufficient reheating of the end of the tool has taken place, by watching the film of oxide which forms on its surface.

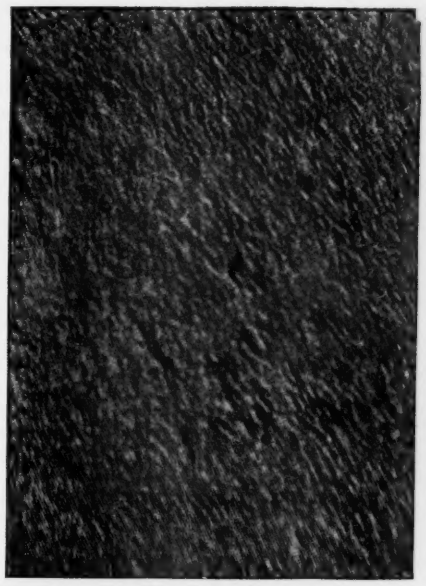


Fig. 5.—Steel With 0.45 Per Cent. Carbon.
(*Quenched and Tempered.*)

As the tempering, after hardening, is necessary merely to avoid an undue hardness of the steel, it is possible in some cases to attain the same end by quenching in oil or other liquid that will cool the steel less rapidly and so allow some of the molecular changes to take place during the cooling, thus obtaining at once a steel of a moderate hardness suitable for immediate use. For obtaining the greatest possible amount of hardness, steel should be quenched in some liquid that will cool it very rapidly. A freezing mixture of ice and salt will cool still more rapidly than ordinary water, but even here the steam produced by the red hot steel prevents it from being wetted, and so delays the cooling. A more rapid cooling, and, consequently, greater hardness can be obtained by using mercury, which may be cooled in a freezing mixture. There is, however, a greater danger of the steel cracking.

A great deal of information with regard to the nature of steel and the effect on it of different heat treatments has been obtained by the use of the microscope. For this purpose a small piece of the steel has one surface polished as finely as possible, and this surface is very lightly etched or corroded by means of nitric acid or certain other chemicals, or even by gently heating the steel until a little oxidation has taken place. The effect of this etching is to attack differently the different constituents of which the steel is composed, thus enabling them to be distinguished under the microscope.

The most common constituents of slowly cooled steel are: *Ferrite* or pure iron, which is soft. *Cementite* or the compound of iron and carbon Fe_3C which is hard. *Pearlite* or a mixture of ferrite and cementite in the proportion in which they occur in steel having about 0.85 per cent. of carbon. This is composed of the ferrite and cementite lying in alternate narrow bands which resemble the ripple marks on sand.

Slowly cooled steel consists usually of pearlite with the addition of either ferrite or cementite, according as the carbon in the steel is less or more than 0.85 per cent. The diagram Fig. 1 shows at what temperature these constituents form during the slow cooling of steel, and

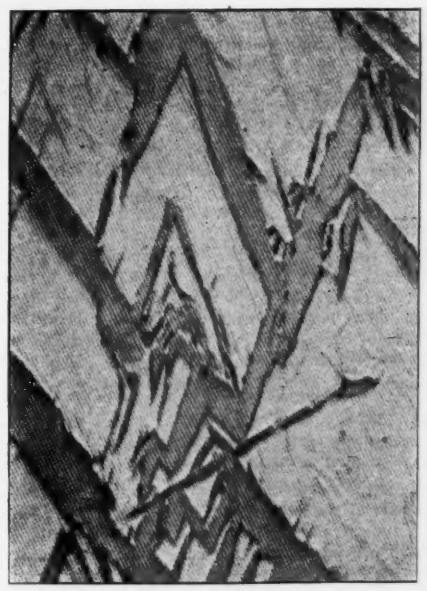


Fig. 6.—Steel With 1.5 Per Cent. Carbon.
(*Quenched From 1,000 Deg. C. in Iced Water.*)

*Abstract of a paper by Prof. A. Stansfield, of McGill University, read before the Canadian Railway Club, November, 1903.

†The phrase "does not absorb carbon" is not quite exact. "Does not hold carbon in solution" would be more exact, but would be awkward and unintelligible without a lengthy explanation.

the diagrams Figs. 2 and 3 show the miscroscopic appearance of two varieties of slowly cooled steel, magnified 1,00 diameters. In quickly cooled steel (see Fig. 4), there is no separation with these constituents, but the whole steel shows a confused cystalline structure. This used to be called *maitensite*, but it has recently been recognized that it is only a modification of *austenite*, and the latter name is now used for the main constituent of all varieties of quenched steels. On tempering the hardened steel a slight change is observed in the microscopic appearance which becomes finer and more confused (see Fig. 5). Fig. 6 shows the appearance of 1½ per cent. carbon steel quenched from 1,000 deg. C. The structure is altogether different from that of normally hardened steel. The white constituent has been called *austenite* in honor of the late Sir Wm. Roberts-Austen. It is non-magnetic, and it is considered that the large amount of carbon has entirely prevented the molecular changes from taking place during the rapid cooling, thus preserving the iron in the non-magnetic or j form. In order to effect this the carbon must all be dissolved in the steel and this can only occur at a very high temperature.

The condition of steel at such a high temperature has become of interest in recent years in connection with the methods of heat treatment adopted in the case of the Taylor-White and other rapid cutting steels. These steels are not really new, but the exact composition, and, particularly, the heat treatment has been improved lately. The Taylor-White steels contain about 3 or 4 per cent. of chromium, about 8.5 per cent. of tungsten and about ¾ per cent. to 1¼ per cent. of carbon. They have a peculiar treatment, which consists in quenching the steel from about 1,000 deg. C, followed by air cooling from about 600 deg. C. The steel so treated is hard, and can be heated to an incipient red heat without losing its hardness. In using a tool of ordinary steel the rate of cutting is limited by the heating of the tool which thus loses its "temper." A tool made of the Taylor-White or similar steel will hold its edge at much greater cutting speeds as the heating does not remove the "temper." A tool of such steel can be made to do work three times as fast as one of ordinary steel, as it can be employed with the cutting edge nearly red hot.

Steel in Car Construction.*

The eastern roads, and particularly the coal and ore carriers, have purchased large numbers of steel hoppers and gondolas. The development of most of these was a direct change of material from wood to steel instead of the general introduction of steel parts. This was brought about largely by commercial enterprise and not a gradual evolution as has generally been the case with other railroad equipment. One important coal-carrying road has adopted the composite construction, employing steel for the frame members which carry the load and wood for the body which merely retains or holds the lading. So far as trucks are concerned very little if any wood is now found in any late designs, particularly of the larger capacities.

On western roads the steel cars are not so numerous. A few roads have some, coal cars mainly, although quite a number of steel underframe box cars have been put into service. The writer recently examined a wreck in which 16 box cars were derailed, a number of which had steel underframes. The ease of handling and the greater salvage of these cars was very noticeable as compared with the wooden cars. Steel has been used, although not altogether successfully, in combination with wood in underframing. Steel center sills in an otherwise wooden frame are liable to an excessive load as it is impossible to make the wooden sills work within the range of deflection allowable in the steel sills. A great improvement is noticeable in the bolsters of wooden cars in which metal either in the solid or a built-up construction is now used to the total exclusion of wood.

There is still a very weak spot, or rather two of them in our box car designs, and those are the ends. Heavy switching shocks and the heavier trains and engines in road service have brought about a considerable increase of mortality in that respect in both old and new cars, and no wood construction is adequate to prevent this trouble. If ever there was a place for steel it is the framing of box-car ends. One prominent eastern road is using structural steel in the sides of box cars, not as members of the framing, but to prevent bulging of the wooden side framing. The time is rapidly approaching, if it is not here already, when we should consider steel for the entire framing of box cars.

Long heavy timber for sills is getting expensive and oak for framing has well nigh disappeared. There is a real need for stronger cars to withstand the strenuous movement of modern transportation. The box car, being the principal type of car used in our middle western traffic, is the one to which attention should be paid and it should be so designed that steel is used for all of the carrying members.

The ideal box car will have a complete steel frame up to and including the side and end plates and probably the carlines. Such a car need be no heavier than the present weight for the same capacity; strong ends can be provided; the part of the load coming to the sides can be carried by the upper framing; bulging need not be taken care of by special provisions, and the general cost of maintenance of such a car will be a fraction of that required for the keeping up of old-style cars.

The writer had the opportunity of making a design somewhat on these lines a few years ago from which 100 cars were built. The side framing was light and the only uncertainty was the possibility of bulging under a flowing load, as of grain. About 18 months after the cars were put into service an inquiry was made regarding the condition of the cars and in particular as to any signs of bulging. The reply was very satisfactory and a portion is here quoted:

"Replying to your letter of the 9th about steel-frame box cars. You will recall that we have 100 of these cars in service, and to their credit. They visit the repair tracks so little that we have had practically no opportunity of keeping close watch on their performance. We have one at the shops to-day, which was among the first turned out. It was shopped for some air-brake repairs, a broken pipe, or something of the kind. The car frame is in perfect condition. From the debris of the car floor I note it has recently been loaded with oats, at another time with shelled corn, and from marks on the siding and lining it has been at one time loaded with something nearly to the roof. I cannot determine exactly what this lading was, but it was something that blackened more or less the sides of the car. There are no signs of lateral bulging and all of the different steel parts appear to be perfectly straight and in as good condition as when new. The lining in the car is not broken, as sometimes occurs in rough handling of heavy package freight; but, as this car has been in service 18 months, it has probably met with the various kinds of treatment accorded rolling stock in this neighborhood. I made inquiry among our foreman and inspectors with reference to this group of cars, and they all report the frames in perfect order on the cars examined by them, except in the case of one which was side wiped. We managed to straighten this one up cold and did not have to cut it apart; the light sections readily lend themselves to this treatment. As we make all repairs to steel-frame cars of the various kinds, it is fair to assume nothing serious has happened to this group of box cars."

It has been laid down as a principle, and perhaps properly, that the carrying strength should be provided in the underframing of wooden box and other cars having a superstructure. The upper framing therefore is light and contributes little in carrying the load. Shrinkage and the working of the body loosens the structure generally and tightening of rods and renailing of siding are considerable items in the expense of maintenance.

It has been conclusively proved that by the use of steel in about 5,500 cars, embracing hoppers, gondolas and box cars on the Norfolk & Western, that the side framing will successfully carry that portion of the load coming to the sides. In a wooden-framed car the braces are compression members and if properly applied give the car its initial camber without the assistance of the truss rods. The posts are not the tension members, as they are not attached to sills or plates. The side framing rods are the tension members, but are generally inadequate to take their lading if required to carry much of a load.

In a steel-frame for a box car both posts and braces are riveted to sills and plates and while the braces do not contribute lateral strength, the posts do, both by their inherent strength due to their section and also by the bowstring action, if it may be so termed. As their load is increased this action comes more and more into play, stiffening the posts and preventing bulging. In the 100 box cars previously referred to, the posts were 3-in. light channels, and you have the testimony in regard to their action. It might be better to use the Z-bar section, and this has been done in later designs.

The end framing when of steel can be thoroughly tied, using angles for corners and I-beams for end intermediate posts, and the possibilities in strengthening these notoriously weak parts of the framing are numerous. With the side framing members securely riveted, it will be seen that there can be no fore and aft working of the body to loosen the nailing of the sheathing and an important gain in maintenance results. With the shallow side sills used in such construction, inspection is greatly facilitated.

Some years ago a lot of hopper cars were built with 15-in. channel side sills. Later another lot of a different design with 8-in. sills were built to the strongly-marked approval of the car inspectors. Easy inspection means better inspection, and when made difficult by covering the parts which should be easily accessible, defects will be missed. The steel underframe, while it has very good points, has this unfavorable feature. A difficult point in the design of steel-frame box cars is to provide stable nailing foundation for the sheathing and lining without contributing materially to the weight and cost in building. This is not an insuperable difficulty, however, as has been demonstrated.

There is a medium ground where weight, strength and low cost of maintenance will meet. While excessive light weight of car means a high percentage of possible revenue load it also means high cost of maintenance, as no structure subject to shock can be whittled down without increasing the liability to earlier failure and an increased repair account. It is possible to design a steel-frame box car of lighter weight than a well-designed wooden car of like capacity. It should cost little if any more and the difference between the two in the longer life and decreased cost of maintenance, if capitalized, will warrant the increased cost and help pay a dividend besides.

There has been some discussion of late regarding the use of steel in passenger equipment. One Chicago road has done some interesting pioneering in this line, but it is probable that progress will be slow in the development of this use of steel. It will come, however, just as surely as steel has taken the place of wood in bridges, tender frames and freight-car framing.

We are using steel extensively for platforms now and for plating sills and its further introduction into the framing may be slow, but it will be sure. The very long timber required for passenger car sills is expensive and steel sills can be obtained full length if desired, although this is not necessary owing to the readiness of splicing. It may take some experimenting to make a steel frame that will be satisfactory in regard to necessary stiffness, yet not so rigid as to unpleasantly affect the riding qualities.

Baggage, postal and combination cars having unsymmetrical, broken side framing would require steel underframing, under-trussed; and four sills are sufficient with riveted-in cross ties or beams to support intermediate nailing strips. Other cars having an unbroken side framing might have a steel truss in the sides well bracketed to the center sills; and with heavy body bolsters such a construction could be made so as to avoid under-trussing. Designing the steel frame will not be as difficult as arranging for the attachment of the wood construction necessary in the structure. The corner and door posts and end framing can be sufficiently of steel to minimize danger of telescoping if not prevent it entirely.

*A paper presented to the March meeting of the Western Railway Club by C. A. Seley, Mechanical Engineer of the Chicago, Rock Island & Pacific.

A New Design of Contractor's Dump Car.

The accompanying illustration shows a contractor's dump car made by the Continental Car and Equipment Co., New York, which has a number of new features. It will be noticed that no horse chains or boards are used to keep the box in a horizontal position, this being accomplished by a simple modification of the common door opening device. The vertical door opening arms move between a pair of arms made of bar iron which are fastened to the sills of the car. The door arm is slotted and the locking pin is easily and quickly inserted and removed. Any tendency of the box to tip is overcome by tension in the arm on the high side and the arm on the low side is relieved

Two-Way, 6-yard Dump Car.

of all compression. To dump the car the pins on the opposite side from which the car is to be dumped are removed and the box started by hand; the arms on the dumping side raise the door automatically. The replacing of the box into a horizontal or loading position is accomplished without much exertion as the top hinges are low down and this greatly decreases the leverage.

The car shown in the engraving has a capacity of 6 cu. yds., level full. The box is 9 ft. long, 8 ft. ¼ in. wide, and 2 ft. 2 in. deep in side dimensions. It is mounted on a substantial truck made of 3½-in. x 11-in. oak center sills, 6-in. I-beam cross-sills and a diamond arch bar side frame of 3-in. x ¾-in. bars. The wheels are double-plate, chilled cast-iron, 24-in. in diameter, and the journal boxes are gray iron, fitted with dustguards, solid bronze bearings and bronze axle end-stops. The journal boxes move in cast-iron pedestals and the load is transmitted to them through heavy coil springs inserted between the top of the boxes and spring plates bolted through the pedestals to the arch bars. An inside-hung hand brake is applied which is operated from one end of the car and which is powerful enough to hold the car when heavily loaded on the steepest grades. The dumping hinges are of cast-iron and designed to carry a heavy excess load; they are reinforced on all sides with heavy ribs.

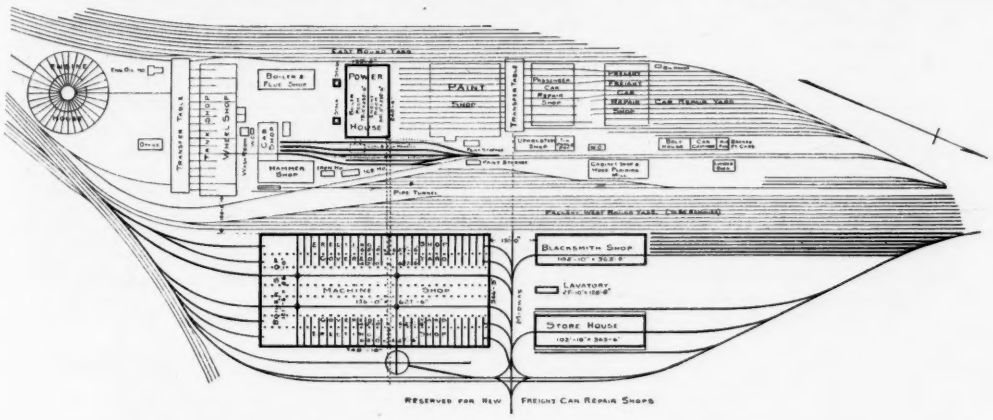
The body or box of the car is stiff and substantial. All of the sills run longitudinally and the floor is laid transversely. The center bed sill is oak and serves as a nailing strip for the floor and also as a support for the top hinges. An intermediate oak sill on each side is rigidly nailed and bolted to the floor and about 12 in. out beyond these are bolted the steel striking or bumping bars. The side sills are angles having post pockets at the ends to take the corner posts. The ends of the box are braced in the middle, both inside and out, the top of the outside braces forming a fulcrum or hinge for the door arms. The door arms rest on corner angle posts which are made of heavy angle iron and form a brace for the side of the end boards. Lock nuts are used in the construction of these cars wherever bolted connections are made.

The angle of dump is 45 deg., and the height of the top of the box from top of rail is only 6 ft. 6 in. These two features, extreme angle of dump and low height of box from rail are characteristic of all the types of "Continen-

tal" dump cars. The builders are prepared to furnish this type of two-way car in 1¼, 1½, 2, 3, 4 and 5-yard capacities, with wooden sills and diamond frame, or with a rigid steel frame. They also make 1¼, 1½ and 2-yard, rotary dump cars, and 2 and 3-yard one-way cars.

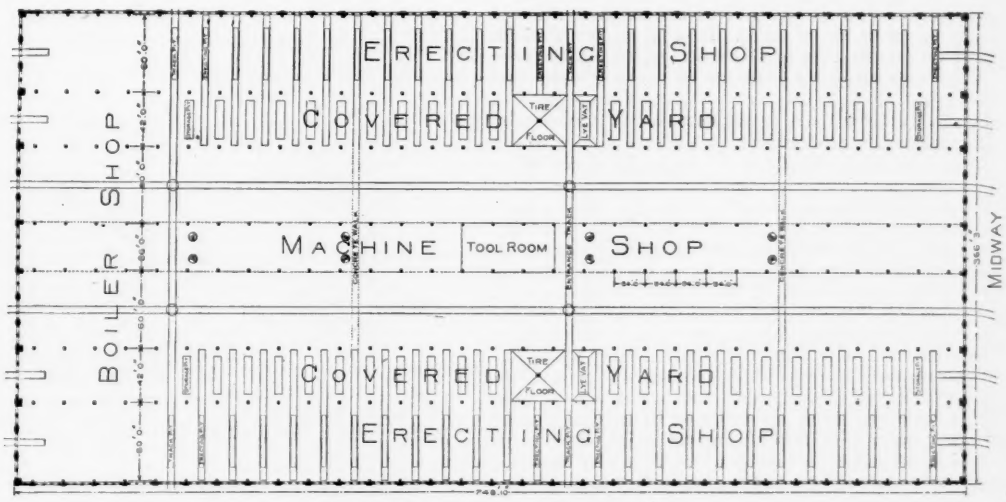
Lehigh Valley Shops at Sayre, Pa.

A brief description of the proposed extensions to the Lehigh Valley shops at Sayre, Pa., was given in these columns May 29, 1903. Further details are shown by the illustrations herewith. In the general layout the light lines indicate the present buildings and tracks and the heavy lines indicate the additions which are to be made. The additions consist of a main locomotive shop, 366 ft. x 749 ft., a blacksmith shop, 103 ft. x 363 ft., a storehouse, 103 ft. x 363 ft., and a central power house, 139 ft. x 240 ft. A space east of the new shops is reserved for new freight car repair shops, which will be built in the future.

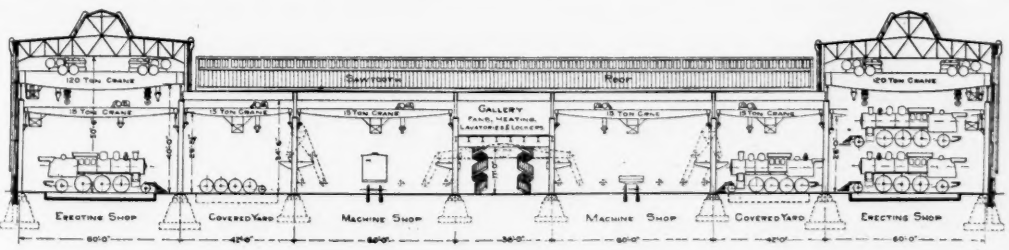


General Layout of Lehigh Valley Shops at Sayre, Pa.

The arrangement of the main locomotive shop is novel. The erecting shop consists of two bays, one on each side of the building. Each bay is 60 ft. wide and contains 26 pits. The space between the two series of erecting pits is divided into five bays. The middle bay is 36 ft. wide and will be utilized for small machinery, bench work, link and motion work, tool room, etc. The fans, heaters, lavatories and lockers will be placed in the gallery over the middle bay. The machine shop on each side of the middle bay is 60 ft. wide. Between each machine shop and erecting shop is a covered yard 42 ft. wide. The pit tracks from the erecting shop extend into this yard, so that the wheels can be rolled out of the way of the erecting shop gang. The covered yard also contains storage pits, a lye vat and a tire floor. The boiler shop, 121 ft. x 366 ft., is at one end of the building.



Plan of Main Locomotive Shop.

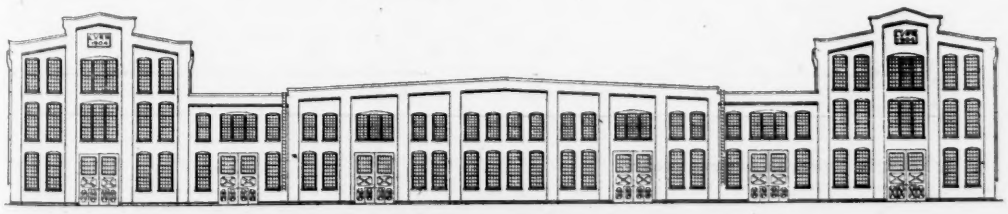


Transverse Sectional Elevation of Main Locomotive Shop.

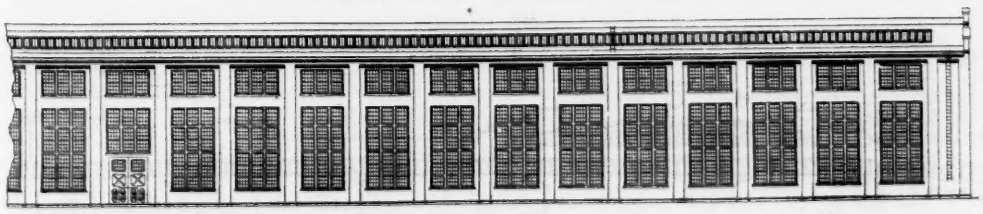
Each erecting bay is served by two electric traveling cranes. The upper crane has a capacity of 120 tons and the crane on the lower runway has a capacity of 15 tons. Each covered yard and machine shop is served by a 15-ton electric traveling crane. All the cranes extend into the boiler shop. The tools in the machine shop will be driven by a combination of group and individual electric drives. The group driving is so arranged that the larger tools can be served by the traveling cranes.

The side windows in the building will contain plain glass except in the main locomotive shop, where ribbed factory glass will be used. The roof and monitor lights will be wired glass. The main shop will be heated by a hot air blower system, the fans being driven by motors. Direct steam radiation will be used for heating all the other buildings.

A bill is pending in the Italian Parliament to secure rest on Sundays for railroad employees. Concerning this 22 local railroad companies (working light and mostly short lines, of which there are many in Italy) have joined in a petition that they may be exempted from the provisions of the proposed law. They assert that it would increase their expenses by one-ninth, and reduce their net earnings by one-third, and that this would reduce the income on the capital invested in them to a pitiable sum, and in some cases destroy it altogether. The traffic of these railroads is chiefly passengers, and on Sundays it is often several times as great as on any other day.



End Elevation of Main Locomotive Shop.



Side Elevation of Main Locomotive Shop.

Demurrage.

The Supreme Court of the State of Illinois recently handed down a decision sustaining the principle of reasonable demurrage charges on freight in cars and holding that a railroad company has a lien upon goods it carries until reasonage storage, demurrage or car service charges have been paid. The decision is important to railroads in Illinois as it is the first case of the kind to be taken to the State Supreme Court since demurrage became an important issue.

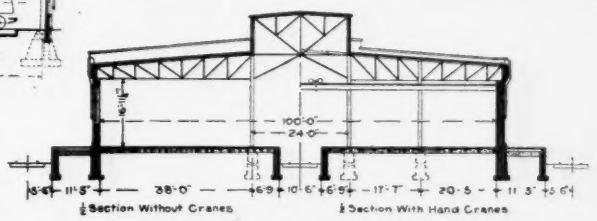
The decision was rendered in the case of Schumacher vs. Chicago & North Western, and it decides a number of other questions of interest. The Chicago Car Service Association has printed a copy of the decision in pamphlet form and presents a syllabus which says:

1. Railroads are quasi-public corporations, and reasonable rules and regulations adopted by such corporations, conducive to the proper discharge of this public duty, should, where they are not in violation of some public law, be sustained.

2. The court reaffirms the doctrine that after the delivery of a car containing the freight, to the consignee, upon its own track, or at the place selected by him for unloading, if he have one, or to the consignee upon the company's usual and customary track for the discharge of freight, and a reasonable opportunity is given to the consignee to take the same, then as to such freight the railroad companies occupy the relation of warehouse men.

3. If cars in which freight is shipped are the property of another railroad than that of the company transporting the same to the point of destination, such latter company bears the same relation to such cars as to the freight therein.

4. It is the duty of the consignee to take notice of the time of the arrival of freight shipped to him, and to be present and to receive the same upon arrival; and he is not entitled to notice from the company that the same has arrived, but the company is authorized to store such freight and to be relieved of its duty as a common carrier.



Transverse Sectional Elevation of Store-House.

5. When a railroad company, delivering freight at its point of destination, has no warehouse at that point suitable for the storage of bulk freight in carload lots, and the property is of such character that the cars in which it is transported furnish a proper and safe place for the same, said freight may properly be held in storage in the cars in which the same was carried.

6. The public interests require that cars should not be unreasonably detained.

7. The case of Jenkins vs. Chicago & North Western, 103 Ill., 588, does not apply in cases of this kind.

8. The free time allowed by car service rules for the removal of goods from a car should not be dependent upon the distance the same may be hauled, or the number of teams employed in making delivery.

9. The object of the rule requiring a charge of one dollar per car per day for car service is not so much for the recovery of revenue as for the enforcement of a rule that is for the benefit of all shippers, and is thereby a public benefit. From the facts submitted to the court in this case the charge of one dollar a day is held to be reasonable.

10. The right of a railroad company to a lien for storage or car service charges that are reasonable is sustained.

Of interest in this connection is a paper read at a

meeting of commission men held in Louisville, Ky., in January, by Mr. J. J. Wilson, Secretary and Treasurer of the Wilson Produce Company, of Pittsburg, in which he defends the railroads in applying car service rules; an unusual procedure for a consignor or consignee of freight. After quoting numerous court decisions upholding the right of railroads to impose demurrage charges and the reasonableness of these charges, he says: "It would work a tremendous hardship on the railroads if they were prohibited from imposing and collecting these charges. They would be at the mercy of every receiver who happened to be short on storage. A demurrage charge, like a tax, is a blessing in disguise. I have noticed in the Pennsylvania produce yards in Pittsburg a class of irresponsible dealers, who have no place of business of their own, probably not even an office conveniently located, and who, in years gone by, have transacted their business in the cars of the railroad company, and have paid one dollar a day demurrage, as required at that time, without a protest. After 48 hours had elapsed, if they had several cars partly unloaded, they would probably unload these cars all into one car and reduce their demurrage accordingly. By so doing they conducted a yard business, without being put to the expense of either store or office rent, and the only expense that they had was simply their yard license and $1 per car per day on whatever number of cars had been held over the prescribed time.

"During the busy summer season there were so many migratory dealers who carried on their business in this way that our produce yards, that only have a capacity of 500 cars, were sometimes so congested that it was absolutely impossible for the regular resident dealers to have their cars placed. Finally the railroad company, as a means of self defence, raised the demurrage charges, after six days, to $4 per day. I think the action of the company was perfectly justifiable. It had this effect, however, that very frequently the resident dealer, who had a warehouse conveniently situated to the yards, could buy produce in the yards cheaper than he could at the source of supply. I know that this action also had a good effect in reducing the terrible congestion of cars, which so frequently occurred, when the demurrage rates ran on indefinitely at $1 per day per car.

"About one year ago the Pennsylvania established in the Pittsburg yards the following rule as to demurrage and storage: Two days were allowed the receiver free, two days following $1 per day, fifth and sixth days at $3 a day and after six days $4 per day. The railroad company under this rule has handled 20 per cent. more freight during the past year than the preceding year and the yards have not been congested in the least. Prior to the time the foregoing rule was adopted it was not unusual for cars to be held several weeks and in one case a dealer held some cars more than 60 days on a rising market. . . . Most of the commission men in Pittsburg in the past appear to have entertained the opinion that demurrage was both unjust and illegal. Some of our people have refused to pay demurrage, but I am informed that the railroad company sued and recovered.

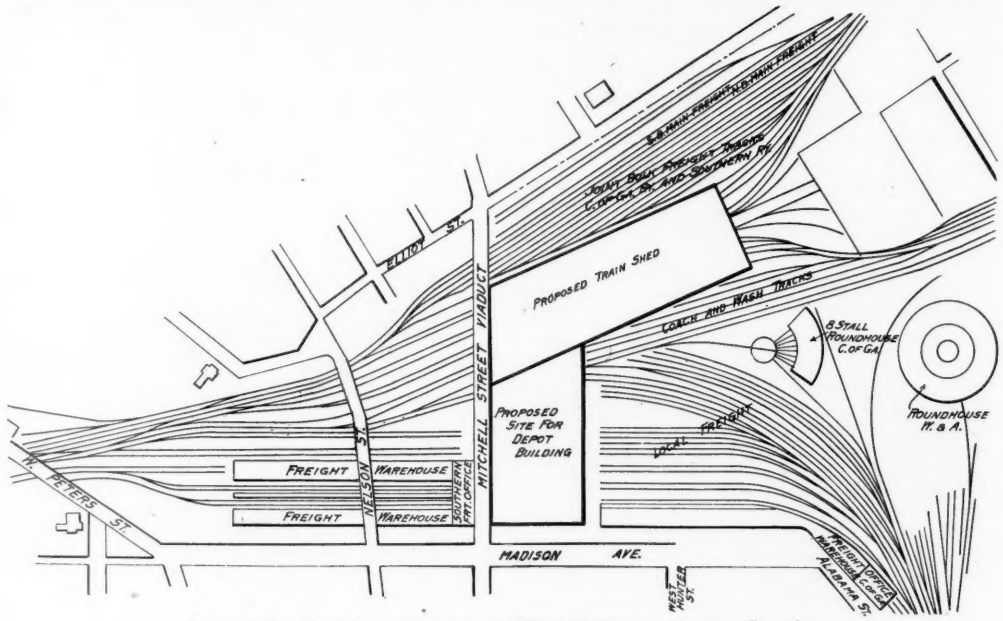
"Some commission men have complained that the railroad company discriminates in imposing these charges, collecting demurrage from some and exempting others, but upon investigation I find no truth in these statements. One or two firms receive and hold cars on an arrangement with the railroad company known as the 30-hour average for each car, hence it would be possible for a firm receiving, say, five cars to hold one car a week free, provided the other four cars were unloaded immediately on receipt. This is a fair contract and is open to every receiver who wishes to avail himself of its advantages. Why should we waste time discussing how we are going to do a certain thing when there is only one way by which to do it?"

Work on the northern end of the Simplon Tunnel was suspended entirely in December, on account of the warm spring tapped, the drainage of which is rendered more difficult by the fact that on this end the excavation has already passed the summit at the center, and inclines away from the entrance. The progress at the south end was 461 ft., and there remained at the end of the year 6,200 ft. to be excavated, or 9½ per cent. of the whole length of the tunnel. In January also no progress was made on the northern end, except in the side tunnel, through which it is intended to drain the hot water spring; but a hot spring has been tapped by this side tunnel also. On the south end the excavation advanced in January 15.4 ft. per day.

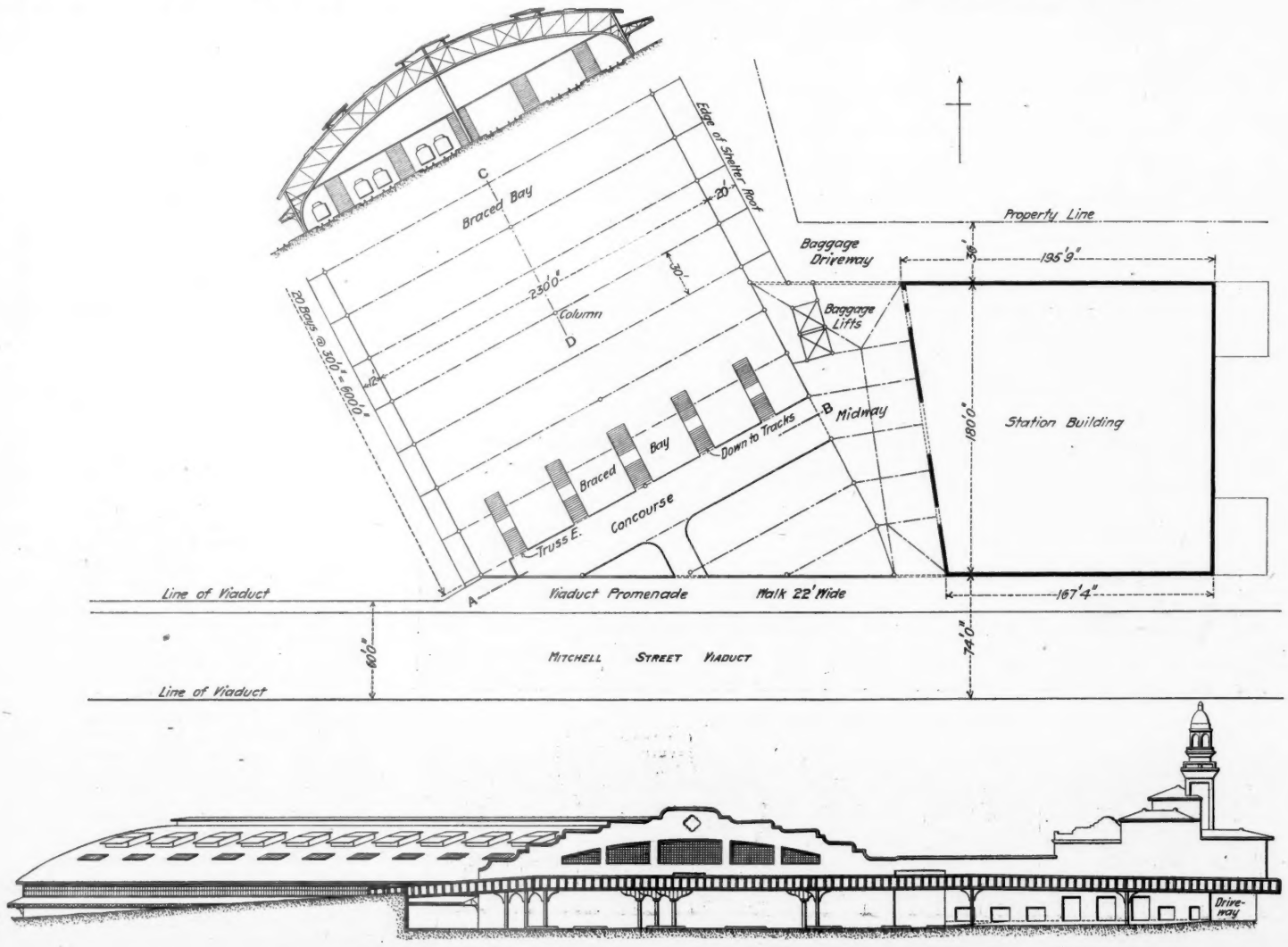
New Passenger and Freight Terminals at Atlanta, Ga.

Extensive and costly terminal improvements are now being made and planned for at Atlanta, Ga., which include the building of a new and modern union passenger station, large receiving and storage freight warehouses for the Southern, Central of Georgia and Louisville & Nashville and a complete rearrangement of yards and tracks of the roads through the city. The total cost of the improvements will be more than $2,000,000. The present union passenger station, which is to be abandoned, is located at the corner of Loyd and Wall streets in the heart of the business district and is used jointly by the Southern, Atlantic Coast Line, Seaboard Air Line, Central of Georgia and Louisville & Nashville. All of the roads coming into Atlanta form a triangle at the eastern apex of which the old passenger station is located. The new station will be built at the southern apex of the triangle on the line of the Central of Georgia, just north of Mitchell street. The estimated cost of the building and the necessary changes in street grades for the approaches is $1,000,000.

On account of the peculiar shape of the property

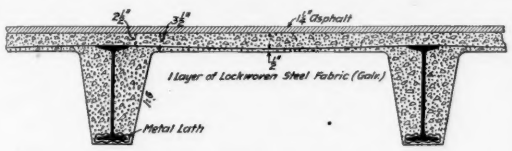


Plan of Terminal Improvements at Mitchell Street, Atlanta, Georgia.

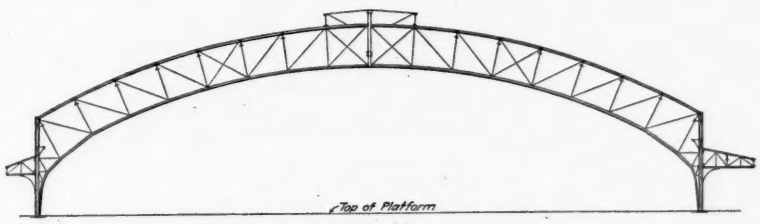


Plan and South End Elevation of New Passenger Terminal at Atlanta, Ga.

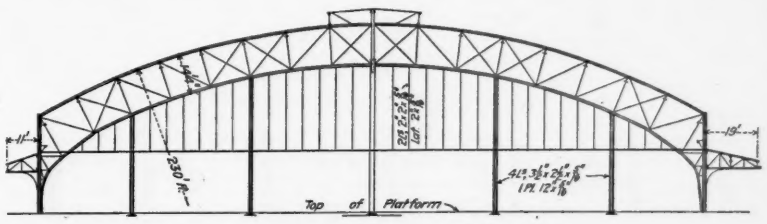
available for building purposes and the difference in level of street approaches and tracks, a somewhat unusual arrangement of train shed, concourse and waiting rooms has been made. The tracks of the Central of Georgia are in a ravine about 24 ft. below the surrounding ground, and Mitchell, Nelson and Peters streets are carried over them on steel viaducts. The new station building will be at the eastern end of the Mitchell street viaduct, facing on Madison avenue, which runs along the top of the eastern bank of the cut. A broad plaza is to be formed at the intersection of the two streets and the main entrance will open out on it. The architectural treatment of the building is Moorish, with the main entrance flanked on both sides with tall towers. It will be four stories high above the street level and will afford every accommodation and convenience for passengers. The building is to be 180 ft. wide, 167 ft. 4 in. deep on the south side and 195 ft. 9 in. deep on the north side. On the main floor will be the ticket offices, general waiting room occupying 8,200 sq. ft. of floor space, dining room, telegraph offices and baggage room. Opening out from the rear end of the waiting room is a large covered midway from which there is an entrance to the concourse, 30 ft. wide, which runs across the train shed at the south end. The main floor of the station, the midway and the concourse are all on the same level. The train platforms, 24 ft. below the concourse floor, are reached by



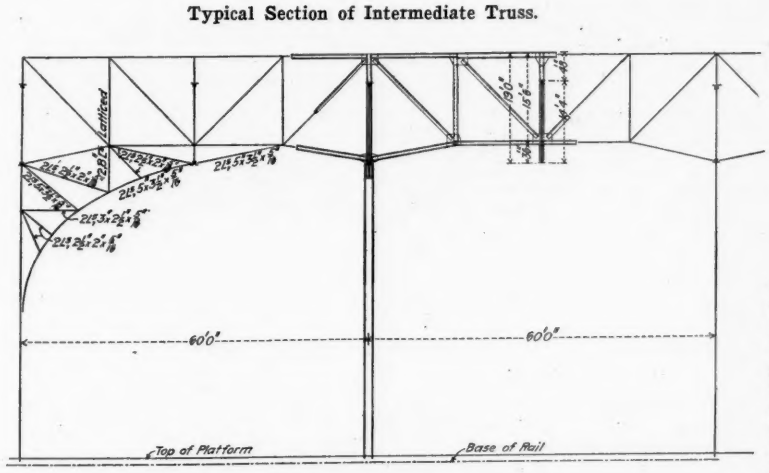
Concrete Protection of Floor Beams in Concourse.



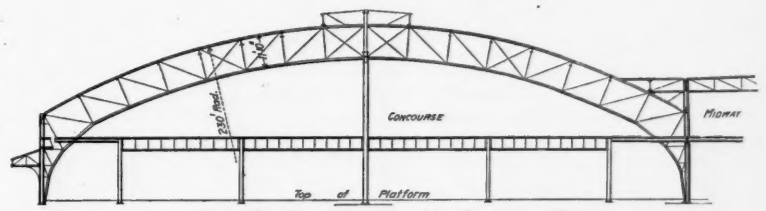
Typical Section of Intermediate Truss.



North End Elevation of Train Shed.



Longitudinal Section C D of Train Shed.



Cross-Section A B, Showing Concourse Floor.

five broad stairways. The main structure of the Mitchell street viaduct will not be changed, but the north foot walk will be widened to 22 ft., the full width between the roadway and the side of the station building and an entrance to the concourse, direct from the foot walk, built.

The accompanying drawings show the general plan of the yards and station and some of the details of the train shed structure. The train shed is 600 ft. long and 230 ft. wide, center to center of side columns, and will span ten tracks and five platforms. An additional track outside the shed on both sides will also be put in, and these will be covered with an overhanging shelter roof built out from the train shed columns. The tracks will lead under the concourse and the viaduct and on out to the main line south.

The train shed roof is supported on trusses spaced 30 ft. apart, the top chords of which are inscribed in an arc of a radius of 230 ft. Alternate trusses are supported in the center on a column rising from the floor. A longitudinal truss or ridge pole is carried down the center of the roof, supported on this row of columns and the intermediate rafter trusses are framed into it so that the true span is but 115 ft. Light is admitted through the roof and ventilation provided for by monitor skylights built in alternate bays and a continuous monitor along the ridge. Glass is inserted in the side walls over the shelter roofs in continuous frames the whole length of the shed. The circular form of the train shed roof is continued over the concourse to the viaduct.

The general plan of the new station and adjacent yards shows the other improvements which are to be made. The Central of Georgia is building a large freight warehouse and office in the space north of the station building and east of the train shed with team delivery tracks and a local freight yard in connection. South of the station, the Southern will build two new freight warehouses about 400 ft. long, under the Nelson street viaduct. West of the station will be a large joint bulk freight yard to be used by the Southern and the Central of Georgia with the main freight tracks skirting its western boundary. Just east of the train shed will be a storage and cleaning yard for passenger cars. The Louisville & Nashville and Atlantic Coast Line are planning extensive improvements in their freight terminals, east of the old union passenger station. A new freight depot 50 ft. x 820 ft. with house tracks and transfer platform alongside is to be built there.

The railroads have combined in planning these sweeping changes, and the Atlanta Terminal Company was formed to carry out the work. Mr. Walter H. Harrison is Chief Engineer in charge, and we are indebted to him for the drawings accompanying this brief description of the improvements.

The Collision at Indianapolis in October.

An officer of the Cleveland, Cincinnati, Chicago & St. Louis has sent us the explanation, given below, of the collision on that road in Indianapolis, Oct. 31, when 16 students of Purdue University were killed. In our account (Nov. 13, page 814) we referred to the reported assertion of the engineman of the excursion train that he would have been censured if he had run more slowly because if he did not run fast he would not make his time; and that if the yard engine had been at rest instead of moving toward him he could have reduced his speed enough to avert the worst consequences of the collision. In our monthly record for October (Nov. 27, page 849) we reported the coroner's finding that despatchers ordinarily notified yardmasters when to expect extra trains (though extras are required to look out for yard trains), and we quoted at length from the coroner's verdict, which confirmed the conjectures that we had made from the early newspaper accounts. He also found that the passenger train was running 30 miles an hour and the switching train nine miles an hour, both in violation of a city ordinance limiting speed to four miles an hour, and that the order on which the passenger train was running (it was an extra) required "a high rate of speed."

The statement now sent to us refers to the peculiar state of the public mind at Indianapolis, on the day of the collision, due to the widespread interest in the anticipated football contest, and continues:

It must be remembered that Indianapolis is not so large a city that the railroad vote is not an important factor with politicians and that the coroner stands for re-election this spring. The finding as to our customs and practice was reached through perversion of the evidence, quotations from it being in one instance the direct opposite of what the witness said; and the finding that the Chief Despatcher was at fault was a palpable absurdity.

We use the standard code. An extra must not run without a train order. Right is conferred by train order and no right may be assumed. A train is an engine or more than one engine coupled, with or without cars, displaying markers. A yard engine is an engine assigned to yard service and working within yard limits. Trains are therefore not yard engines nor yard engines trains. An order to run extra with right over all trains means what it says but no more. It does not mean "also over yard engines" any more than it means "also over flagmen" or "regardless of track conditions." The rules plainly imply that an extra has no superiority over yard engines unless made so by special instructions or given such right in its train orders. Our special instructions do not make it superior to yard engines, nor did its train orders give the Purdue extra right over them. Owing to the peculiar situation, however, we have special instructions on the time-table drawing attention to the point that trains not scheduled must be kept under control in the part of the yard where the accident occurred, expecting to find the track occupied by yard engines. The peculiar situation is that at North Indianapolis all freight trains diverge and run over the Belt Railway to the east side of the city; and between North Indianapolis and Union Station there are but five scheduled passenger trains in each direction, and during working hours there are but four.

In this part of the yard there are a great many industry and team tracks and several yard engines are working in it. We receive deliveries from foreign yard engines on these tracks and such engines of necessity move the same as our own. It would not be practicable or safe to run extras through such territory except under control. This condition has existed for years, and every engineman and trainman knows it. The fact that the newspaper reporters and the coroner could not or would not understand the situation does not in the least alter it. It does not happen once a year that a freight train runs over this track, in fact I think I am perfectly safe in saying it does not happen once in two years, and extra passenger trains are very infrequent, not averaging one a week during the summer excursion season and usually none at all in the winter. The assertion therefore of the newspapers and the coroner that our rules were violated there daily and with our knowledge was without foundation. The only previous case of violation was on the occasion of a wreck obstructing the Belt Line, about three years ago; we had to run a freight train through the city that did not comply properly with the rules and collided with a yard engine; and although the damage was trifling, we took occasion to enforce the rule by suspending the engineman and conductor from duty. Only a few weeks before the accident to the Purdue extra an extra with officials met a yard engine at almost the same place, but the extra was obeying the rules; it stopped and waited for the yard engine to stop and get out of the way.

Much was said in the newspapers about the engineman being obliged to run at unsafe speed to comply with his order. An order is never to be obeyed when it is known to be unsafe to do so; that point is taught trainmen by precept and example continually. Since the definition of "schedule" has been a part of the code, the form of order used (Form F) is not called a schedule and this point is made plain in teaching and examining our men. The time given at stations is approximate only and is for the benefit of trains over which right is given, being restrictive upon the superior train. However, the speed specified in the order, if complied with, could not have caused the collision; it occurred at the farther end of a tangent where the view was as clear as on any straight line between stations; either houses nor trees obscured the view of the engineman for more than 2,000 ft. before reaching the point of collision, and the last 1,000 ft. of it was on a 32-ft. ascending grade. Compliance with his order under the circumstances would have rendered the accident impossible. Compliance with the *rules* and the order under any circumstances would have rendered it impossible. The train had been delayed and the engineman was trying to recover lost time where he should not. He was running fully 50 miles an hour up to a point within a few hundred feet of the point of collision, while the speed of the order, even admitting that it was compulsory, was only 18 miles an hour.

At our investigation the conductor and engineman both admitted a correct understanding of the rules, and that they should have been under control. Their contrary statements before the coroner are only to be accounted for by the fact that there was before them the fear of being indicted for manslaughter. As an evidence of the engineman's knowledge of his responsibility, I quote the following from his statement taken at our investigation and corroborated by the brakeman who was riding on the engine with him, sitting on the fireman's side; just before passing North Indianapolis and before shutting off steam he said: "You want to keep your eyes peeled here, we are liable to meet a switch engine." I think this shows the chances he had resolved upon taking.

The engineman assured us that he did not make the statement quoted in your issue of November 13 (nor many others attributed to him in the newspapers). The train despatcher, who was 75 miles away, did not say anything to the engineman.

The conductor and engineman were the only ones who disobeyed rules; the accident was the direct result of that disobedience; had they obeyed the rules the accident would not have occurred and the responsibility of it, therefore, rests solely upon them.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

On March 14 the Supreme Court of the United States decided that the Northern Securities Company is an illegal combination in restraint of trade by virtue of the fact that it is a majority stockholder in two competing railroads, the Northern Pacific and the Great Northern. The form of the decision is an affirmation, on appeal, of the decision rendered April 9, 1903, by the United States Circuit Court of Appeals, at St. Paul. The plaintiff is the Attorney General of the United States. Those interested in the details may find a full abstract of that decision, together with an extended discussion of it and of subsequent developments in the *Railroad Gazette* for April 17, August 7 and December 18, 1903. The kernel of the whole matter seems to be that a majority stockholding, by a corporation organized for that purpose, of competing roads, being a potential restraint of trade between the States, is, under the Sherman act, a real and unlawful restraint. This is the view of four judges; and a fifth, Judge Brewer, agrees with them in their decision, though not entirely in their argument. This is now the law of the land and will so remain until, as will inevitably happen when the Sherman act is fully and impartially enforced, that law is so modified as to secure its beneficent results without its present effect of restraining human energy. That the question was difficult is shown by the fact that this decision is affirmed by five Supreme Court Judges and denied by four of them—a bare majority. The majority opinion, prepared by Justice Harlan, sticks closely to the question of the acts of the stockholders of the Northern Securities Company, having little to say on the much-debated question of the difference between owning stock and doing the acts of a stockholder.

Justice Brewer concurs with the majority, not on the ground that the Anti-Trust law forbids all restraints on commerce, reasonable and unreasonable, but because he deems this particular case an unreasonable restraint. He says that he was with the majority of the court in the trans-Missouri Freight Association, the Joint Traffic Association, the Addystone Pipe and the Montague Trust decisions, but while a further examination had not disturbed the conviction that these cases were rightly decided, he thought in some respects the opinions went too far. "Instead of holding that the Anti-Trust act included all contracts, reasonable or unreasonable, in restraint of interstate trade, the ruling should have been that the contracts there present were in themselves unreasonable restraints of interstate trade, and therefore within the scope of the act. Congress did not intend by that act to reach and destroy those minor contracts in partial restraint of trade, which the long course of decisions at common law had affirmed were reasonable and ought to be upheld." It would appear, therefore, that only four of the nine justices now stand by the trans-Missouri decision, and that, therefore, the view of the court on questions which may come up hereafter, is not the foregone conclusion that it has lately been thought to be. The longest dissenting opinion is by Justice White. The chief burden of his argument is that the Government, in moving, under the Sherman law, to emasculate the Northern Securities Company, is endeavoring to regulate and control the buying, selling and ownership of shares in a corporation created by an individual state; and that is unconstitutional. He declares that the majority of the court is trying to make such ownership interstate commerce. He also says that if Congress may forbid this combination, it may forbid the stockholders of any railroad corporation from combining (as they do) to carry on their ordinary interstate business; for all such business partakes somewhat of the nature of a monopoly. Justice White's main contention appears to have been prominent in Justice Harlan's mind as he prepared the majority decision, for unusual stress is laid on what the Northern Securities Company does (controls the business of parallel railroads) with little emphasis on how its acts are carried out; and the method of preventing the exercise of this control is left for the lower court to devise.

To Prevent Injunctions in Trade-Union Disputes.

In November last Mr. Grosvenor of Ohio introduced in the House of Representatives a bill "to limit the meaning of the word 'conspiracy' and the use of restraining orders and injunctions in certain cases." A public hearing has been held, and in labor circles its passage is warmly advocated. It provides in substance that no agreement, combination or contract to do or procure to be done, or not to do, or procure not to be done, any act in contemplation or furtherance of any trade dispute between employers and employees in the District of Columbia, or in any territory of the United States, or between employers and employees engaged in interstate trade or commerce with foreign nations, shall be deemed criminal, and that those engaged therein shall not be indictable or otherwise punishable for the crime of conspiracy, "if such act committed by one person would not be punishable as a crime." It further provides that such agreement or combination shall not be considered as in restraint of trade or commerce; and yet further that no restraining order or injunction shall be issued with relation thereto. The bill specially states that all other conspiracies shall continue to be punishable as crimes, as now provided by law.

A slight examination of this measure shows that it has two real purposes; the first is to exempt from punishment criminal acts if committed in furtherance of a labor dispute, and the second is to take away from the courts the power to prevent such crimes.

It is to be noted that the result is the same whether the criminal acts are committed by employers upon employees or by employees upon employers; in either case the criminals shall go free from the restraints of civil law or punishment of criminal law. This provision is pointed out by the supporters of the bill as a special mark of its fairness, as applying impartially to labor and capital alike. Considered economically it would be quite bad for Labor, if Capital should have the legal right to do unlawful acts against Labor to its great loss, without power in the courts to prevent or punish. And so it would be quite as bad for Capital, if Labor should have the right to inflict violence and ruin on capital with impunity. To legalize a crime is to encourage it. And to encourage competition in criminal acts between Labor and Capital tends to distort and destroy their natural relations to such an extent that neither can discharge to the other its economic duty, or preserve its own economic existence.

From a political standpoint the tendency would be perhaps even worse, if this bill should become a law. For disorder and violence grow upon what they feed, and when the lawless elements in the community once realize that they are untrammeled when enlisted in the cause of labor disputes, they will soon learn to gratify all their evil propensities under that pretext, or what is quite as easy and more safe, to create a labor dispute for the sake of the license it will protect. Conditions and environment being thus favorable, turbulence and lawful lawlessness would beget more of their kind till society would find it unendurable. While these results would inevitably follow from such pernicious legislation, happily an enactment of this kind is not probable, or if it were to become a law, it would not be long a menace to our welfare. For we entertain no doubt that once passed such an act would be promptly nullified as unconstitutional.

The bill seems clearly to be class legislation of an unmistakable type; it exempts from punishment for crime, employers and employees whenever such crime is committed in furtherance or contemplation of a labor dispute, while all other citizens doing precisely the same thing in another cause are to be punished. The law is thus neither equal nor uniform. Its administration is partial and select. Some can be, others cannot be punished for a certain crime. The fathers of the Constitution were quite familiar with the old world doctrines of special privileges and immunities and sought by that great instrument to give all such practices a death blow; and they seem to have done it most effectually. The Supreme Court has jealously and zealously guarded the nation from this particular violation of its great charter, and during the course of its long and honorable career has pronounced void more than one law entrenching upon this sacred ground.

But this measure seems to be unconstitutional for another and, if anything, a stronger and clearer reason; and that is, that it seeks to prevent the Judiciary from redressing a wrong, if it be committed in the name of a labor dispute. Under our system of Government, the Executive, Legislative and Judiciary departments are clearly marked and outlined. Each in its own field is entirely independent of the others. Neither can encroach upon the domain of the others. Congress can no more deprive the Judiciary of its functions than the courts can deprive Congress of its power to pass a constitutional act. The inherent function of all courts is to administer justice, to pass judgment upon controversies, to redress grievances by awarding money compensation, or, in proper cases, issuing restraining or mandatory orders, to prevent threatened wrongs. It is not competent for Congress to say to the courts that it shall or shall not render a certain judgment, or to enact that a certain class of citizens shall inflict grievous wrongs upon another class without power in the courts to prevent or punish such wrongs. The vice in all such measures is that they change the very essence of the Judiciary, paralyze its functions, and thwart the purpose of its institution. The great bulwark of justice is doubtless the love of it in the heart of the Anglo-Saxon people. And they have expressed this regard by constituting a pure, powerful and wise judiciary to stand guard for ever over the rights of the humblest citizen. That at least is the theory of the Constitution, and that up to this time is the way it has been interpreted. Should labor succeed in effacing reverence for justice from the public heart, the courts would not long survive. But their downfall would leave nothing worth the having either to labor or anybody else.

Our friends in the ranks of Labor little realize that the court of equity, which they dread and hate so much in these days, was created for the very purpose of protecting the poor and humble man against the rich and strong man. The time was, when the courts of law, by reason of their technical and narrow procedure and the influence of the great lords, had ceased, or had never got to be, a poor man's tribunal. Vested interests, special privileges, and the hard cruel maxims and principles of feudal times rendered the law courts friends of the rich and powerful rather than impartial dispensers of justice to all. And so sprang up the custom of resorting to the Court in Chancery where controversies were disposed of upon principles of natural equity and good conscience. All who had no adequate remedy in the courts of law were welcomed in the Court of Equity, which found itself obliged to invent remedies and lay down principles unknown to the Common Law, in order to accomplish justice between man and man. It was thus a court of evolution, while the Common Law courts had become fixed and unbending. It has never ceased to grow with its environment or to respond to the demands that good conscience has required of it. Its influence to-day is if anything greater and more beneficent than centuries ago. Its principles have grown to be more delicately conscientious with the advance of civilization. Its courage and power have increased with its moral worth and insight into right and wrong; its remedies have become more plastic, pervasive, adaptive and redressive as modern life, with all its complications, has advanced and needed just such help.

And all this has come, only after much bitter opposition, as a sort of survival of the fittest. It has come, not by chance but rather in response to a great law of development of which the world is becoming more and more conscious. Labor may oppose it and congressmen may continue to introduce bills against it, but we fancy the development will still go on, and the Court of Equity will yet give a better account of itself in the future than it has in the past. This progress has not always been uniform or equal. Individual judges have decided wrongly; others have

but indifferently represented their high office; still others have been corrupt. All these things have been, or will be, corrected in time. But after making allowance for all such errors, shortcomings, and occasional corruption, it still remains true that the judiciary both in this country and in Great Britain, retains and deserves the respect and confidence of the people, and constitutes the best expression of the genius, and the hope and mainstay of the Anglo-Saxon race.

The most malignant feature of this bill is that which forbids the issue of an injunction to prevent or discontinue the infliction of irreparable injury. The Court of Equity is distinguished not alone by the application of conscientious principles in forming its judgment. What makes it different from all other tribunals is its august and fearful power to enforce its decrees to the last detail upon each and every individual subject to its jurisdiction. Its writ of injunction runs in all directions, high and low; none may disregard it. The most lawless and brutal mob is separated into its elements, and each individual called to account for any interference with, or violation of, the mandate of the Court. This penetrative and deadly power in the court is what the bill proposes to paralyze, for the simple purpose of enabling the agents or allies of labor unions to work all the wrong they may to the property and the person of others, without interruption and without responsibility. What ought to solace the unions in the disappointment we think they are bound to meet in this matter, sooner or later, is the reflection that each exercise of the strong arm of the court is the subject of review by a yet higher court and whatever injustice may have been thus done will be corrected if it lies in the best educated intellects to discern it and the amplest power and authority to do it. We are thus arriving gradually at a system of sound and wholesome principles on this subject, and when the end is reached, it will doubtless be found that on the whole Labor is quite as much blessed by the result as anybody else.

HOWARD R. BAYNE.

Passenger Traffic in New York and Brooklyn.

During the year ending June 30, 1902, the total number of passengers carried by all the steam roads in the United States, aggregating about 200,000 miles of line, was 655,130,236. During that same year the Interurban, Interborough, Brooklyn Rapid Transit, Coney Island & Brooklyn, Van Brunt Street & Erie Basin, New York & North Shore, New York & Queens County, Staten Island Midland and Richmond Light & Railway companies, representing the combined traction interests in Greater New York, carried 877,712,441, exclusive of transfers. The sum of the business done by these New York systems on their respective day of maximum traffic during the last three months of 1903 was about 4½ million passengers. This, be it observed, for a single day, while the Michigan Central railroad during the year ending June 30, 1902, carried on its entire line about 3¾ million passengers. The number of passengers above quoted as carried in a combined maximum day of the New York lines exceeds the passenger business of the entire Atchison, Topeka & Santa Fe system for the year 1899.

These rather far-fetched comparisons are made with a view to putting life and significance into the extraordinary figures of New York local traffic, which are so great that in themselves they convey but little idea to the mind and make it easy to confuse millions with hundreds of thousands. But the annual increases alone in this metropolitan traffic must be measured by millions of passengers, the traffic itself must be measured in hundreds of millions. By far the greater part of this human multitude must be carried through city streets where slow moving trucks and vehicles of every sort afford a frequent hindrance. Moreover, while in every great city the distance from the home to the office or workshop is apt to be great, in New York the difficulty is heightened by the shape of Manhattan Island, which has been previously referred to in the *Railroad Gazette* as being somewhat similar to a sharpened lead pencil, with the business section at the point. How to get the workers to their offices in the morning and back again at night, with enormously heavy traffic concentrated into an hour or two at each end of the working day, with the least possible friction and the greatest possible comfort and speed, is a very grave problem which only recently has received anything like the requisite amount of attention.

Manhattan Island now has its subway nearly completed and a comprehensive plan of further rapid transit relief has been mapped out with fair prospect of its being carried out along lines not widely dissimilar from the suggested plan. This has already received attention in the *Railroad Gazette*, as has also a similar comprehensive scheme of relief for Brooklyn, but at the present time the conditions of rapid transit between New York and Brooklyn, combined with traffic originating in Brooklyn, seem almost hopelessly bad, while the number of passengers carried increases week by week and day by day. The daily newspapers paraphrase the legal maxim that there can be no wrong without a remedy into an optimistic belief that there can be no evil without a scapegoat. The traffic congestion of the present day in Brooklyn is to their eyes a palpable evil, the Brooklyn Rapid Transit Company the scapegoat. Their attitude is hysteric and a large proportion of their statements is untrue. Following constant complaints of the daily press the New York State Railroad Commissioners authorized C. R. Barnes, their electrical expert, to report on transportation conditions in Brooklyn and make recommendation, and his report is now at hand.

To adequately explain the congestion in Brooklyn requires the use of a map supplemented by knowledge on the part of the reader of the exceedingly complicated and irregular layout of Brooklyn thoroughfares. It is sufficient to say that through these streets the Brooklyn Rapid Transit Company operates some 1,200 cars daily, which average about 88 miles per car, or, say, 100,000 car miles a day; a mileage equal to about four times the circumference of the globe! The situation can be in part summed up by saying that the main artery of street-car traffic which originates in New York and terminates in Brooklyn is the Brooklyn bridge. Fourteen lines of surface cars are operated from the New York end of the Brooklyn bridge to different points in Brooklyn and the surrounding territory, in addition to the cars originally intended to run on the bridge, which haul a certain number of local passengers who do not take conveyances at the other end, and a far greater number who continue their journey on the Brooklyn elevated. From 5 o'clock to 6.30 p. m. an average of 121,295 passengers (1,347 a minute) are carried on the Brooklyn system. When the cars from these 14 lines diverge from the Brooklyn terminal of the bridge they branch out from two severely congested main stems into a network of branches. At each branch there is a sharp curve which adds to the difficulty of getting the cars promptly out of each other's way. The first curve of all, which is met by the cars turning towards Washington street, or to the left, is so sharp and the rails become so much worn by the tremendous traffic that partial derailments there are common during the rush hours. But in addition to the cars carrying through New York traffic, cars from the ferries and local Brooklyn cars must constantly be interwoven into the chain. In short, during the rush hours the lines are run absolutely at their maximum capacity; the introduction of any more cars would serve only to create delays, and any troubles along the line, particularly on the bridge or on the streets through which the main volume of traffic must pass before it can be diverted, throws the entire system into great disorder until it can be remedied.

The first and most obvious cause of trouble is vehicle traffic on the bridge. There is an average of 17,495 passengers carried on the surface lines over the bridge in one hour and a half in the evening, and a broken or stalled truck which would delay the movement of cars for half an hour during this period, as not infrequently happens, delays 6,770 persons. The Commission holds that with due consideration for the commercial interests whose business requires traffic by trucks between Manhattan and Brooklyn, justice to the large number of people inconvenienced by such traffic demands that drastic rules be adopted to prevent the delays to car traffic caused by it. It is recommended that the passage of heavy trucks, or other vehicles which might interfere with the free movement of ordinary vehicles in a single line over the bridge between the hours of 5 and 6.30 p. m. should be absolutely prohibited. All vehicles passing over the bridge should be confined to a single line and not allowed to approach near enough to the tracks to prevent the movement of cars.

Only two other recommendations are made, one providing for a change in the route of cars at the Brooklyn end of the bridge to take a considerable portion of the traffic off one of the two diverging stems and constitute a third stem, and the other recommending a line to be built along Livingston street, which parallels Fulton street, the main business thoroughfare of Brooklyn, at a point where the congestion is greatest. It is also suggested that this street be widened to permit of a double instead of a single line of tracks. It can readily be seen, however, that the relief which would be afforded by these changes would be slight and temporary in character. What is necessary, and imperatively necessary, is to divert the surging mob of humanity that attacks the Brooklyn bridge every evening to a number of different and widely separated routes. The comprehensive rapid transit plan for the Borough of Brooklyn previously referred to comes nearer being a step in the right direction, in spite of the cost and complexity of its recommendations. The present difficulty and danger attending traffic is a radical one and radical means for its relief must sooner or later be undertaken. Meant me, the Brooklyn Rapid Transit, in the words of the cowboy's epitaph, is doing its damndest; angels could do no more.

The decision of the Illinois Supreme Court concerning demurrage, printed in another column, is of interest not only by reason of its main point, that a railroad has a lien on freight for the cost of storing it in cars, but also for some of the minor points mentioned. It is difficult to see how any court can rule other than that a charge for storage of goods in a car should be recoverable on substantially the same basis as a charge for storage in a house. It should be equally axiomatic that the public interest requires that freight cars keep moving as large a percentage of the time as possible. A railroad company is, indeed, liable for any lack of energy which amounts to a neglect of its duty to transport goods with reasonable despatch, and theoretically, the lumber dealers and other complainers may be right in trying to make more prominent their right to the recovery of a penalty for such neglect; but practically the railroad itself has a constant and powerful motive to keep its cars moving, so that it seems quite certain that a law to hasten the movements of freight cars could have no effect in improving freight-train service. When freight is abnormally slow in its movement the cause may be an unavoidable obstacle or it may be lack of energy and of discretion on the part of the officers of the company; but if the obstacle is unavoidable the company should not be subject to penalty, while if the trouble is lack of brains in the management, such lack cannot be supplied by statute. Most delays are quite nearly unavoidable, and a law imposing a penalty would necessarily result, ultimately, in an increase in the rate. It is a good thing, now and then, to reiterate the old doctrine that a consignee is not entitled to notice of arrival of his goods. The court also clears the atmosphere by its declaration that free time should not be dependent on the number of wagons or horses owned by the consignee. Both of these propositions are lucid enough, and are based on simple legal principles, but the railroad companies have done some things to obscure them by their voluntary concessions to consignees and shippers, both in cases of reasonable demands and also in many cases where they have been unreasonable. Giving notice of arrival is unbusiness-like, because it encourages consignees to waste a day. If notification were required by law, there would have to be some allowance of time for beginning to unload, after the receipt of the notice, and it would be impracticable to fix this allowance at less than one day. Again, a large percentage of consignees desire no notice, and that means a waste of clerical labor. In very large cities the inevitable friction of freight movement makes notices a necessary evil, but that does not affect the general principle. Favoring a shipper or consignee because he has to cart his freight over five miles of muddy roads, and has but one team, is another feature in which railroads have tried, with the best of motives no doubt, to avoid being unjust; but from a strict legal standpoint the injustice that needs attention is the inequitable burden which is thus put on the shipper whose shop or farm is nearby and whose facilities are not inadequate.

The Supreme Court of the United States has had occasion once more to interpret the law concerning the liability of a railroad company for damages to the heirs of a passenger who is killed while riding on a pass. One would think that this question had been long since settled, but the lawyers continue to find new kinks in the statutes. The present case, No. 143 of the October term, 1903, was that of the Northern Pacific against L. H. and F. H. Adams, widow and son of Jay H. Adams, of Spokane, Wash., who, while riding on a pass, was killed by falling off the platform of a rapidly moving train. The accident occurred in Idaho, and the statute of that State allows the heirs in such a case to recover damages from the person causing death if it resulted from his wrongful act or negligence. The deceased had accepted the usual conditions as printed on the pass. The widow and son secured a verdict and judgment of $14,000 in the Circuit Court, and this judgment was sustained by the Court of Appeals, but the Supreme Court, in a decision by Justice Brewer, reverses these judgments and orders the Circuit Court to grant a new trial. The Circuit Court charged the jury, in substance, that although the railroad company did not fail in its duty to the deceased it could yet be held responsible to the widow and son for the damages they suffered by reason of the death. This, says Justice Brewer, is a misconception; their right of action arises only when the death is caused by wrongful act or neglect. It cannot be that an act rightful toward the deceased is wrongful or negligent to the heirs. There was no question that Adams was a free passenger. The specific negligence charged was the placing of a non-vestibuled car in a vestibule train and running a train at a high rate of speed around a curve; but as the man had walked through the train in one direction and fell off on his return, the Court held that he must be presumed to have known that one of the cars which he had passed through was not vestibuled. Non-vestibuled cars are in constant use all over the country. The rate of speed is held to have been reasonable, because the train got through in safety. However, the Supreme Court assumes, but without deciding, that the jury was warranted in considering the absence of the vestibule platform and the high rate of speed as negligence; but it was not wilful or wanton negligence. As to the liability of a railroad to a free passenger for injury due to ordinary negligence, any number of cases can be quoted on both sides, but these do not seem to have affected the opinions of the justices of the Supreme Court either way. Justices Harlan and McKenna dissented.

The Nashville, Chattanooga & St. Louis publishes the record for the past 15 years of the number of trains moved over the short section of its single track line which is worked by the block system, and the total for the year 1903 was 22,017, or an average of 60.3 trains a day. The highest number on any one day was 80. This is the line between Chattanooga and Wauhatchie, 4.4 miles long. A length of 1.6 miles adjoining this is double track and on this double track section the average number of trains daily was 70.4. These statistics are published (as they have been for a number of years past) to show the high degree of safety secured by the use of the block system. The total amount expended on account of the block system—which means, we suppose, the cost of collisions due to failures in block working or disregard of block signals—has been, for the 15 years, 65 cents. This includes both the double track and the single track sections, six miles

in all. This is equal to 72 cents per 100 miles of road per year. If we accept a basis of comparison which seems to be in favor (?) of late, we may from this average readily figure out that the whole of the 200,000 miles of railroad in the United States ought to be able to get off for less than $1,500 a year.

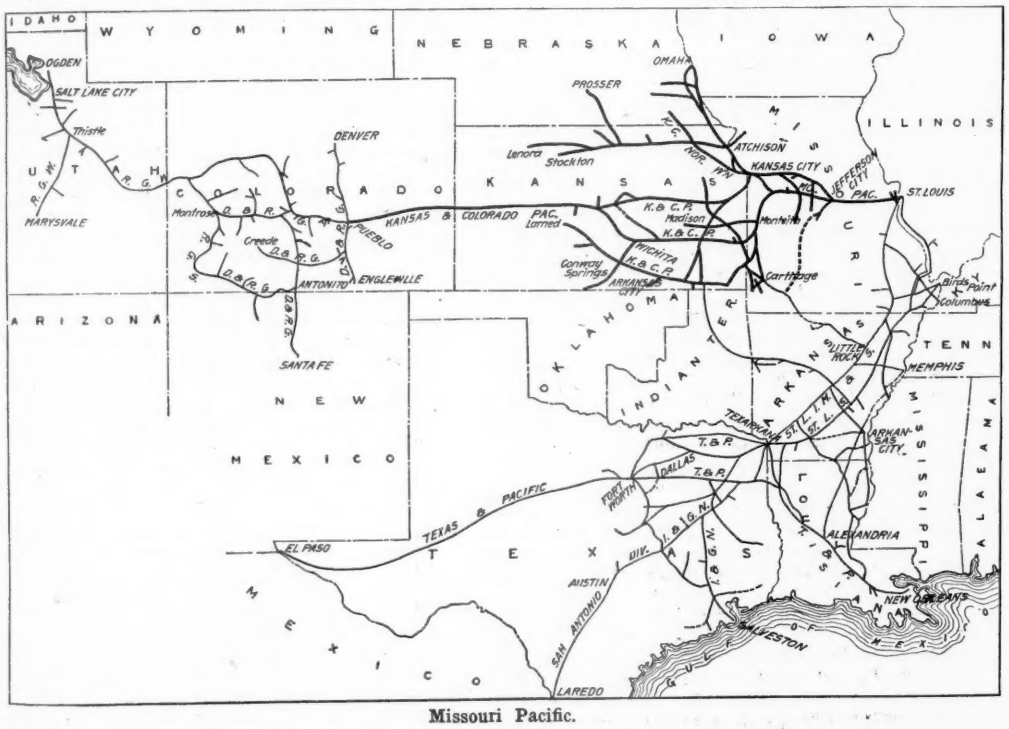
The white pine lumber production continues to decline. Last March we traced the history of this industry, which has had an important part to play in the development of the country, especially beyond the great lakes, and found that it grew, with slight interruptions, from 3,595 millions of feet in 1877 to 8,594 millions in 1892, and had fallen yearly since then, and even after 1897, during a period of extraordinary prosperity. Now 1903, when the demand for building materials in the Northwest must have continued active, the falling-off in the production of white pine is exceptionally great. In millions of feet the production has been, for the last six years, as shown by the elaborate statistics of the *American Lumberman*:

1898.	1899.	1900.	1901.	1902.	1903.
6,155	6,057	5,485	5,336	5,294	4,792

The production last year was nearly 10 per cent. less than in 1902 and the smallest since 1878. Unfavorable weather conditions may have had something to do with reducing the production, but without any doubt it is chiefly due to the exhaustion of the forests. The production of hemlock lumber in the white-pine territory, which not very long ago was so inconsiderable that no account of it was made, last year was equal to 28 per cent. of the white pine cut and a little more than in any previous year, and there was also some increase in the hard-wood lumber production.

Missouri Pacific.

Gross earnings for the year ending December 31 amounted to $43,095,769, an increase of $5,600,081, or about 15 per cent., and net earnings amounted to $13,680,765, an increase of $1,228,268, or about 10 per cent., following the tendency shown in substantially all the reports of the last six months for operating expenses to increase relatively faster than earnings. Besides the increased cost of working occasioned by higher wages, higher cost of materials, etc., the Missouri Pacific has been at an unusual disadvantage because of the Kansas floods and adverse weather conditions elsewhere. During practically the entire year nearly all the main lines were



Missouri Pacific.

crippled by high water in the Mississippi and Missouri rivers and their tributaries, while in May the Kansas City flood, which has been fully described and illustrated in the *Railroad Gazette*, cut Kansas City off from communication with the outside world and it was four months before normal traffic conditions were approximately restored. The floods reached St. Louis early in June and seriously crippled interchange with eastern roads, while another period of high water followed by interruptions to ferry service by ice during November and December kept St. Louis and other terminals congested during the latter part of the year, so that normal conditions have not yet been fully restored. Taking these things into consideration, the system shows considerable prosperity as the result of the year's operations.

The portion of the Gould system which the present report covers includes the Missouri Pacific, Central Branch, and St. Louis, Iron Mountain & Southern railroads, which worked an average of 5,846 miles during the year, as against an average of 5,613 miles last year. After adding interest on investments, dividends on stocks, etc., to net earnings, and deducting from the gross earnings thus obtained the sums necessary to provide for interest on bonds and rentals of leased lines aggregating $7,107,353, as against $6,645,672 last year, there remained a net income of $7,586,493, an increase of approximately a million dollars from last year. From this surplus 5 per cent. dividends were paid, as previously, and a surplus of $3,696,378 remained. It is interesting to note that the surplus income this year would have sufficed to pay over 9 per cent. dividends on the stock had it been applied according to the English practice.

From the surplus $1,249,672 was appropriated for additional property acquired and improvements to road and equipment during 1903. The chief expenditures were in the line of general betterment work, the largest single item, $543,715, being for excess weight in renewals of new steel. New side tracks also cost $435,837 during the year. The work of changing grades, replacing light bridges by permanent structures, lengthening side tracks, increasing track facilities at terminals, and other betterment work, as planned three years ago, is now nearing completion. This work has resulted in practically rebuilding 634 miles of main line, not including rebuilding 158 miles of the Little Rock & Fort Smith between Little Rock and Van Buren, and it is expected by the management that the economic benefits from this improvement work should begin to be reflected in decreased cost of transportation during 1904, and subsequent years. The total income expenditure for the year aggregated $2,228,283, $978,611 coming from surplus income accumulated in 1902 and laid aside for work in 1903. A small balance has also been carried forward applicable for work in 1904. As the work planned is nearly completed no specific appropriation has been made from the surplus income of 1903 for improvements to be made this year. It is anticipated that the surplus income for 1904 will be more than sufficient to provide for such expenditures. The charge for maintenance, exclusive of special appropriations, has presumably been ample; $958.51 per mile was charged for maintenance of way and structures, while repairs to locomotives averaged 6.9 cents per mile run and repairs to freight cars average .49 cent per mile run. Train load has improved materially since the improvement work began, as will be seen by the following table, which includes only revenue freight:

	Mo. Pac.	I. M.	Entire system.
1900	209	271	231
1901	228	307	259
1902	235	352	281
1903	254	378	302

Work is now in active progress on seven new lines. The Memphis, Helena & Louisiana *Railway*, on which $1,625,545 has been spent to date, the Memphis, Helena & Louisiana *Railroad*, being the Louisiana incorporation of the above, on which $1,048,822 has been spent, the White River, in Arkansas, on which $4,721,446 has been spent, and four smaller lines, of which the most important is the Eldorado & Bastrop, on which $822,979 has been spent.

The total capital expenditure during the year aggregated $25,701,754, of which $3,835,421 was paid from current resources. The chief item in this capital expenditure was for the acquisition and construction of new mileage covered by the River and Gulf Division's mortgage. This expenditure aggregated $11,136,226. For equipment purchased $8,792,014 was spent, and for stocks and bonds of various branch roads and other proprietary companies, principally deposited with the trustees of the unifying and refunding mortgage, $2,284,641 was spent. The new funds were realized from an increase in funded debt and equipment obligations, no new capital stock having been issued. In order to provide for the expansion of the Iron Mountain system to meet the existing large volume of traffic and to provide necessary transportation requirements for the rapidly developing tributary company, the St. Louis, Iron Mountain & Southern during 1903 authorized an issue of $50,000,000 of bonds, called the River and Gulf Division's first mortgage 4's, of which $20,000,000 par value have been sold to pay for new mileage building. The bonds are deliverable pro rata, as the mortgage for which they were appropriated is completed and ready for operation; $13,316,383 of bonds and scrip have been issued to December 31, as accounted in the increase of capital mentioned above. The balance of the 20 millions will be delivered during the present year. The following table shows the chief operating statistics:

	1903.	1902.
Average miles worked	5,846	5,649
Gross earnings	$43,095,769	$37,495,688
Freight earnings	31,271,688	26,817,423
Passenger earnings	7,126,378	6,425,249
Operating expenses	29,415,004	25,043,191
Maintenance of way	5,603,056	4,621,700
Conducting transportation	11,237,604	9,514,028
Net earnings	13,680,765	12,452,497
Gross income	14,693,846	13,190,294
Surplus for year	7,586,493	6,544,622
Dividends paid	3,890,115	3,855,110
Betterment appropriation	1,249,672	2,615,871

NEW PUBLICATIONS.

Preservation of Timber. By Samuel M. Rowe, C. E., M. Am. Soc. C. E. Souvenir edition, revised. Chicago. 1904. Size, 3¾ x 6¼; 203 pages; index; bound in leather.

The first issue of Mr. Rowe's handbook on timber preservation appeared in 1900. A second edition is now published after a revision and extension of the scope of the original work. The introductory note explains that the primary purpose of the treatise is to furnish and collate information regarding the practical workings of timber preservation, and to serve as a handbook of information both during the construction and during the operation of the works. The author, who is a designer of timber-preserving plants, uses the zinc-tannin or Wellhouse process, and the first half of the book is devoted to this process. Layouts of several plants of the author's design (two of which have been described in the *Railroad Gazette*, April 6, 1900, and May 30, 1902) are shown. The rules for operation are quite detailed and give a lot of information that should be helpful to a man not well grounded in the principles underlying the process and in its practical workings.

The latter half of the book discusses burnettizing, creosoting and other processes, giving briefly the history and a description of each, advantages and objections, relative or actual cost, etc. Processes using creosote are treated more at length and are illustrated. Following this is an essay on the value of treatment of timber, in which the author sums up his observations from a close study of the subject extending over many months. A diagram is presented, prepared from the records of the Atchison, Topeka & Santa Fe for 17 years, showing graphically the percentages of ties removed in successive years. An abstract of the article, including this diagram, was printed in the *Railroad Gazette*, Aug. 21, 1903. The final pages contain some notes of a miscellaneous nature, and a number of half-tone views of preserving plants of the author's design.

TRADE CATALOGUES.

Henry R. Worthington, Inc., New York, has published a handsome descriptive catalogue of the Worthington centrifugal pumps. These pumps are made in three different designs, the conoidal, the volute and the turbine. The conoidal pumps are designed for low lifts and large deliveries and are adapted to irrigation work and for pumping sewage or surface water. The volute pumps are built for medium lifts up to 70 ft. and for all capacities. They run at moderate speeds and have shown an efficiency under test of 86 per cent. The turbine pumps are suited for very high lifts up to 2,000 ft., and are made in types from single stage to five-stage, depending on the lift. In principle they are the exact opposite of the multi-expansion steam turbine. This class of pumps are particularly adapted for mine pumping and similar work.

Crosby Steam Gage & Valve Co., New York, issues a four-page pamphlet which gives illustrations and brief descriptions of 18 of its steam specialties, including gages, pop safety valves, water relief valves, blow-off and gate valves, pressure recording gages, indicators, gage testers, whistles, revolution counter and the Branden rubber pump valve. A large variety of other steam engine and boiler attachments are shown in its general catalogue.

National Electric Co., Milwaukee, Wis., in Catalogue No. 60, recently issued, describes the principal features of construction and design of the different sizes and types of alternating current machinery which it makes. Generators are made in sizes from 37½ to 1,500 k.w., either belted, engine type or direct coupled. Tables are given of the principal dimensions of the various sizes, operating speeds and weights.

The Remington Typewriter Company has just published a pamphlet describing its various kinds of typewriters and fully illustrating all the latest improvements. The pamphlet also contains a description of the different styles of type which may be used and complete illustrations of the new Remington billing and tabulating attachment. A description is given of the Remington typewriter desks and office furniture.

The Railway & Electric Equipment Co., of Philadelphia, of which Mr. Elwood C. Jackson is president, issues occasionally a 36-page list of electric lighting and trolley and steam railroad materials which it has for sale, and indicating materials which it wishes to buy. It reads like an

inventory and is interesting as well as valuable in showing the tremendous amount of replacements being made.

The Chicago & North Western has prepared a Russian-Japanese war atlas showing railroad and steamship lines, towns, rivers and mountains in Japan, Russia, Korea, Manchuria, China, etc., including a map of the world, with marginal index. In the back are given figures on the area, population and financial condition of the two nations.

The Railway Signal Association.

The March meeting of the Railway Signal Association was held at the Great Northern Hotel, Chicago, on Tuesday, March 8, President J. C. Mock in the chair. Mr. F. J. O'Connor was appointed secretary of the meeting. The minutes of the previous meeting were approved as printed. Twelve new members were elected. The amendments to the by-laws proposed at the January meeting were then taken up in their order and all were rejected except the three following: That altering Sec. 3 of Article 1 to read ten members instead of three members was carried by 21 to 4; that amending Article 2, to read ten members was carried unanimously, and that proposed by the Chicago committee, altering Article 1, Section 1, to read January, March, May, September and October, was carried by 21 to 2. (This last vote, changing the annual meeting from November to October, and making no other changes in dates of meetings, carries out the only change that was approved in January by both the New York and the Chicago meetings held in that month.)

RECORDS OF SIGNAL FAILURES.

The meeting then took up the questions which had been proposed for discussion, namely—

1. What is a signal failure? For example, when an engineman or a trainman reports encountering a caution or a stop indication which was due to "train in block," "open switch," "broken rail," "deranged equipment due to wreck," or "unknown," should such cases be reported as signal failures?
2. Should the rules require a stop at all home block signals against a train; and should a "waiting time" be specified? How long should the waiting time be?

The Secretary first read letters from Messrs. C. C. Rosenberg, F. P. Patenall and J. E. Spurrier. Mr. Rosenberg sent a sample of the blank used on the Lehigh Valley for monthly reports. His two principal heads are "avoidable" and "unavoidable." Stops not chargeable to the signal system are not called failures. Sometimes, of course, a fault will be difficult to classify. A bond wire torn off by a passing train and causing a stop should be classified as unavoidable; so should a stop due to a line wire broken down by heavy wind or sleet. Mr. Rosenberg raised the question whether a train should stop on account of a light in a distant signal not burning; some roads are stringent in requiring obedience to this rule, while others are not. As to time, a full stop at a signal is sufficient; there is no reason for waiting one, two or three minutes.

Mr. Patenall specifies nine causes for stops which he does not class as failures of the signal system, namely: train in block; light out; switch left open; derail in siding left closed; broken rail; derailments; switches run through; dirty track, and high water. He advocates a stop of one minute at home signals.

Mr. Spurrier agreed in general with the foregoing views, but a stop reported as due to unknown cause he would class as a signal failure. He favors a full stop but no waiting time, except that on steep ascending grades heavy trains ought to reduce the speed only to three miles an hour.

Mr. Christofferson.—I think these questions can be answered in a very few words. A signal failure occurs only when a signal fails to indicate the true condition of things. In regard to stops, if the train comes to a full stop, that is all that is necessary.

Mr. Wileman.—Any stop by reason of a signal indicating true information surely cannot be called a failure. And as for stopping, the object is to restore the time interval between succeeding trains, and the time necessary is governed by the character of the traffic and the frequency of the signals. If we are depending on signals three or four miles apart trains might require as much as two or three minutes to restore the normal time interval.

Mr. Hope.—Would it not be a good idea to have a committee appointed to report on what constitutes a signal failure?

President Mock.—During the winter we have had in the *Railroad Gazette* some experiences with signals in cold weather. Now, how are those failures recorded? In the reports that we must make to the operating department, we want to show just how much delay has been caused by the signal system. It is hardly fair to say that we had 50 signal failures during the month of January if 25 of those failures were due to broken rails, switches that were forced open because of ice on the point, or something of that sort that the signal system is designed to detect. We should have a uniform blank. Some committee should gather blanks from different roads and submit recommendations.

Mr. Peabody.—The failures which we charge directly against the signals are those which come under the headings of broken or defective materials and poor maintenance. Broken and defective materials include all broken line wires, broken bond wires, unless we find that they have been broken by section men, or by something dragging, broken boot-leg wires under some conditions, broken wires in the line, broken battery jars, and anything that is either due to material which is defective or becomes defective in its use. Poor maintenance, I think, is self-explanatory.

Mr. Foster.—A uniform report is not practicable. There are a great many different makes of signals in use now. We require from our repairmen that they give us the exact cause of the failure. Now, in giving that exact cause they could not conform to prescribed wordings and arrangements without an impracticable blank.

President Mock.—But signal engineers all over the country are asking for information about signal failures. We need a summarized report for the benefit of the operating department and in case you want to furnish data to another road to be able to give it so that comparisons can be made.

Mr. Raymer.—Here is a question: a repairman doing his routine work comes along to a signal and finds it at stop, with nothing in the block; is that to be reported as a signal failure?

Mr. Peabody.—Yes.

Mr. Foster.—If we prepare information for officers above the signal engineer it must not be too voluminous, or they will not examine it carefully. What they want is the record of false signals, and they do not care particularly what is the cause of them; but it would not be possible to get up a sheet that would give the signal engineer himself all the information he wants. Our office requires of the supervisor a sketch of every piece of signal apparatus that is broken; these sketches are all preserved in book form; that is valuable information for a signal engineer, but it cannot be tabulated on a sheet.

Mr. Christofferson.—I understand that many roads put down as signal failures what other roads would not consider signal failures, and a committee which should decide what should not be charged as failures would do valuable work.

Mr. Foster.—If you are going to report to a general manager all you want to tell him is the main fact. In case of a false clear indication that is all he wants to know; he does not care whether it is the track relay or mechanism or what not. But for yourself, and you have a dozen different kinds of relays, you want a record of what kind of relay it is; that you cannot get on a sheet of reasonable size common to all roads.

Mr. Clausen.—I agree with Mr. Foster in regard to report blanks. That word failure does not exactly describe the condition. The signal failure is looked at from two standopints. From the standpoint of the operating official, any signal indication which does not correctly indicate the condition of the track is a failure. For instance, if a derail on a sidetrack is closed, and the signal indicates stop when the track is perfectly safe for the train to proceed, for the operating official that is a failure. But if the same thing occurs when there is a car standing just inside of the fouling circuit, not close enough to the main line to interfere with a train, that also would usually be a failure to the operating official, though under certain conditions that same car would be unsafe.

Mr. L. L. Whitcomb (by letter).—. . . It is not doing justice to the signals to charge the "unknown" stops against them, as many of these are due to the opening of switches by trainmen when they know that they have not sufficient time before the approach of the train. Again, these are often found to have been due to trains backing into side tracks which have not quite cleared the main line. (As to stops on steep ascending grades, Mr. Whitcomb agrees with Mr. Spurrier, but observes that a report should be made the same as though the train actually stopped. No waiting time need be specified as the time needed for the air-brakes to release enforces a sufficient delay.)

Mr. Shaver.—A train should not pass any stop signal at any rate of speed without first stopping. I have ridden on engines a great deal, and I find the tendency is to consider about 30 miles an hour a "slow-down." They should always be made to stop. To wait two minutes might be a serious delay; one minute would be more nearly right.

Mr. Everett.—Why is a lamp out called a signal failure? We note simply "lamps out," without using the term "failure."

Mr. Christofferson.—If the lamp is out it is a failure of a signal to perform its duty.

Mr. Shaver.—I do not agree with Mr. Foster that the higher officials are not interested as to what the cause of the failure is. I find that they are and they try to cooperate in finding a remedy.

Mr. Raymer.—If a signal fails and is repaired before any train reaches it, I doubt if it should be called a signal failure. I do not think the record should go above the signal engineer.

Mr. Peabody.—Our reports do not specify how many trains have been stopped by the signals, and it would be very difficult to find out; it is the signal failures that we are after and that we are reporting.

Mr. Foster.—I would like to know if it is the sense of the members present that an engineer should stop at a signal where the lamp is out, provided he can see the position of the blade. I have been on engines on moonlight nights, when we could see the blades as well as the lamp, and where the lamp was out, and the engineer did not slacken up, and I did not report him.

Mr. Clausen.—It is not necessary to stop if the position of the blade can be seen. That leaves a point open for discussion in case of accidents, but as a matter of principle I believe it is right.

Mr. Pflasterer.—I think some roads incorporate in the rules that the signal light being out, if the engineer can see the position of the blade he may proceed.

On motion of Mr. Shaver, it was voted that the Topic Committee be instructed to gather the information necessary to enable the Committee on Records to present a blank for adoption by the Association for use in recording what are called signal failures.

PERFORMANCE OF AUTOMATIC SIGNALS IN COLD WEATHER.

At this point the meeting took up Mr. Balliet's paper on this subject which was printed in the *Railroad Gazette* of Feb. 26.

Mr. Shaver.—On the Union Pacific all signals are operated by the gravity battery. The track cells are placed in the customary chute, which is set in the ground so that about six inches of it at the top is exposed. We have not used very much care with reference to the material used in banking around these chutes, and I believe Mr. Balliet brings out a point to be considered. At one place within the last winter we had a little trouble from the track battery beginning to freeze, the chute being 7 ft. long. The chute was in very sticky clay and in filling in around it I think some quite large rocks were used. We do not put any cells of battery above ground; it is unwise where the temperature may remain in the neighborhood of zero for a week or so. We have now some signals "up in the air," that is, 5,000 ft. to 8,000 ft. above the sea, where we have had a great deal of cold weather, and I have used a tub with a long neck, the body of the tub being buried under the earth and the top covered with four to eight inches of earth.

Mr. Peabody.—The theory that the power to work a signal should be located at the signal does not apply in the case of a battery, as used with the enclosed disk signal, for if there is a cross between the block wire and the common wire and the battery is at the signal, the signal may give a false clear indication, whereas if the battery is located at the farther end of the circuit, such cross will cut the battery off from the signal and you get a danger indication.

President Mock.—Mr. Balliet's paragraph beginning "Extraordinary precautions have been taken to protect," etc., is also open to objection. Our experience for the past three years has been, with nearly 600 motor signals equipped with glass, that when the motor is practically air-tight it is free from any trouble caused by frost gathering on the commutator.

Mr. Clausen.—Our experience will verify that. We have only had one case of a commutator freezing up this winter, and that was where a piece had been broken out of the glass.

President Mock.—Some years ago I tried felt and flannel, but they are of no value. Neither are lamps.

Mr. Clausen.—Mr. Balliet lays certain troubles to improper filling around chutes 8 ft. deep; the frost in the neighborhood of St. Paul this year was 8 to 10 ft. deep; proper filling would not help the matter in that case.

Mr. Christofferson.—I have one battery in an iron chute which froze in spite of everything we could do to prevent freezing; about 300 ft. from that one we had another (smaller) track battery in a well of the same depth, 7 ft., and it has never frozen up. The one that froze was next to a home signal pole which was concreted, and the only conclusion I could come to was that the frost followed this concrete down. I have decided to move the chute away from the pole.

Mr. Hope.—We have a few wells in which, owing to the severe frost, a lamp will not answer, and we use a small oil stove. This, with a little ventilation, works all right. But the frost has reached a depth of 8 ft. in our part of the country, so that we need both deep holes and, in some cases, oil stoves.

Mr. Peabody.—Frost in batteries has given us considerable trouble; in fact, we have had about 30 oil stoves at work for the last six weeks. Wherever we have discovered that frost was beginning to affect a battery we would put a stove in; then after relieving that battery move it to another place; in that way we have had comparatively few failures, but it has taken lots of hard work. I think that next year we shall put manure around our chutes in the fall.

Mr. Christofferson: I believe the best way to keep a battery from congealing is to have it new in the fall of the year. Since I have adopted that practice I have had no trouble.

President Mock.—We endeavor to follow that rule. (Replying to a question.) Our batteries for automatic semaphore signals in Canada are buried about 2½ to 3 ft. The top of the jar is about 3 or 4 inches below the surface of the ground; then below the jar there is a space of a foot. In the bottom of a number of these boxes we put manure and with complete success. But the manure was hardly necessary.

Mr. Hope.—In a colder climate you would put batteries one or two feet lower, wouldn't you?

President Mock.—Yes, if I had to deal with temperatures 40 below zero; but it may be cheaper to do as you have done—put a lamp in the chute. Deep chutes cannot be drained easily. The shallow box that we use can be drained and the box is big enough to hold some water without flooding the batteries.

Mr. McWain.—We have had very few signal failures on the Pere Marquette. We have two signals at Port Huron

that have been operated by motors; have had no trouble from frost there. The battery wells are of concrete, 7 ft. deep; the motors are operated by storage batteries, charged from gravity batteries.

The Secretary then read a letter from the Committee on Distant Signals, and, on motion of Mr. Hope, a vote of thanks was extended to the committee. Its report, which had been presented in November, was accepted as final, and the committee was discharged.

The Location of the Knoxville, La Follette & Jellico Railroad.*

In March, 1902, the writer was tendered a position as Engineer of Construction of the Knoxville, La Follette & Jellico, with the assurance that the line was to be built through difficult country. In the following paper he has set forth the economic considerations which determined each important step in the layout of what he believes is the most important engineering work undertaken in recent years in the section of the country in which this road lies. The general location of the Louisville & Nashville line in this vicinity is shown in the accompanying sketch map, Fig. 1. The Louisville & Nashville was in entire or partial control of some 900 miles of road to the south of Knoxville, with which it has direct connection only at Montgomery, Ala., and connection through a controlled line at Atlanta. In order to have these properties closely united to the body of the system as well as to operate through trains from Cincinnati and Louisville through Knoxville to Atlanta, it was necessary to fill the gap

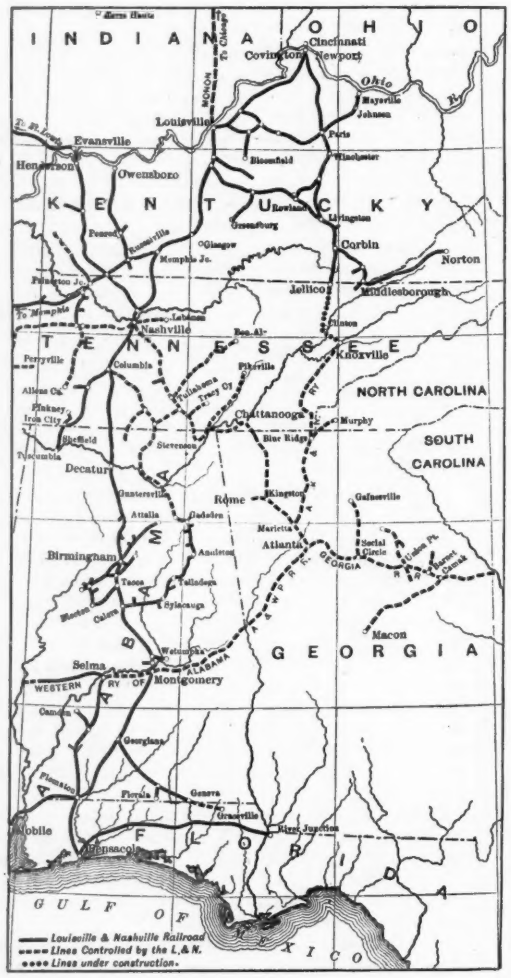


Fig. 1.—Map to Show Connections Afforded by Cut-off.

from Jellico to Knoxville. As a fair traffic could be safely counted on at once for the new line, expensive construction was warranted if necessary to secure good grades and alinement.

Walden's Ridge and Cumberland Mountain, as shown in Fig. 2, divide the district into two parts, unlike in geography, topography and geology. That portion of the country to the northwest of this ridge and mountain is part of the Cumberland Plateau of the Apalachian province and the drainage for the most part is to the north and northwest into the Cumberland River. The portion of the district to the southeast of this divide is a part of the great valley of East Tennessee, and the general drainage is to the southwest into the Clinch and Tennessee rivers. The country to the southwest is broken and rugged, with an elevation of from 2,500 to 3,600 ft. on the divides, large areas being above 3,000 ft. The streams fall rapidly from their sources but emerge into the valleys at elevations of from 800 to 1,100 ft. These valleys are deep and narrow and the slopes rise brokenly. The mountain ranges are cut in two by occasional streams and thus all possible routes on reasonable gradients are well defined.

In the valley district, erosion has produced a series of long ridges separated by long, parallel and narrow valleys which follow closely the belts of rock. Their general direction is northeast and southwest, thus crossing the direction of the line of survey, which lay somewhat northwest and southeast. The surfaces of these small valleys are at elevations of from 800 to 1,100 ft., and the parallel ridges rise from 100 to 500 ft. above them. Some few of these ridges are cut in two by streams, but most of them are continuous for many miles. Copper Ridge, on the south side of the Clinch, which ridge is responsible for the second large detour to the westward in the line of road between Coal Creek and Knoxville, was such a continuous ridge. From the point where the road cuts through it, for 30 miles to the northeast, there is not a gap in which the crest is not more than 350 ft. above Bull Run valley on the north side of it. The conditions as to continuity were somewhat similar in the case of the two Black Oak Ridges. Thus the problem of getting the best location was a more difficult one in the less rugged country.

Clear Fork river cuts through Pine Mountain in a gorge called "the Narrows," so rugged that no domestic animal had ever traversed it. It lay across the straight line joining Saxton and Knoxville. The stream, Big Creek, cuts through Cumberland Mountain at Big Creek Gap, which lies some 24 miles from Saxton and about four miles west of the direct route. Further, a branch line of road had been built through this gap (see Fig. 2), and to a connection with the Southern Railway near Careyville. At the gap, the mining town of La Follette, with limestone and sandstone quarries, coal and iron mines, coke ovens, a furnace, etc., had sprung up and in three years had grown from a village of less than 500 to a population of more than 6,000. Thus these two water gaps were objective points. In fact, the route through these points had often been explored, and at least two careful surveys had been made on it during the 20 years or more that the Louisville & Nashville Railroad had had under contemplation the extension of their Knoxville Division to the city for which the division was named. As there were watercourses leading from each of these points toward the other, the choice of the route joining them lay simply in deciding which slope of the narrow valleys offered the best support for the adopted gradient. But these valleys were so tortuous and narrow that in a distance of three miles on one of them it was necessary, even when using 10-deg. curves with 300-ft. minimum tangents, to bridge the watercourse ten times and use three short tunnels.

It was plain, from the conformation of the country, that there would be long ascents and descents on whatever ruling grade was adopted. The chief local product of the country being bituminous coal, in great quantity and of good quality, the market for which could only be southward, since the country to the north and west was tributary to the Pittsburg coal fields and that to the east to the Virginia coal fields, it was good economy to spend more money to secure light grades against southbound trains than for trains in the opposite direction.

The writer decided on 53-ft. compensated grades as the maximum, but an economical construction required the introduction of a 61-ft. grade on the long descent from the Cumberland-Clinch divide to La Follette. The road was located from Saxton to this divide on this ruling grade, with an inconsiderable amount of adverse grade two miles from Saxton, at a point where its introduction was comparatively harmless.

An adverse grade has been defined as a grade pitching in the opposite direction from the general slope of the country. Of course, it means the introduction of just so much rise and fall which could be avoided.

The line from La Follette to Knoxville had not been reconnoitered. It seems possible to get a line from the Cumberland-Clinch divide down to the Clinch without adverse grade, but from the Clinch to Knoxville, across the short ridges and valleys, it seemed that the road would have to rise and fall with the country, and the writer expected at the outlet that the condensed profile of this part of the line would look like the teeth of a saw. By going down Big Creek from La Follette to the Clinch and then turning down the Clinch as far as the mouth of Bull Run below Clinton, and by making three crossings of the Clinch, a route was possible, leading through Clinton, a town of 1,200 people, which gave no adverse grade from La Follette to Clinton and an adverse grade of only 48 ft. between Clinton and Bull Run at a point about four miles southwest of Clinton, where it was necessary to cut across country, leaving the river to save distance and excessive curvature.

The location from the mouth of Bull Run to Knoxville introduced more difficult problems than any other part of the line, and the writer believes that the combination of conditions which enabled this line from the Clinch to Knoxville to be laid out, on the original 53-ft. grades, without one foot of adverse grade and without a tunnel or high valley crossing, is unique and unusual in such rough country. The profile of the Southern Railway line from Clinton to Knoxville (see Fig. 3) is a fair representation of the necessary line that goes plunging across these ridges. An old locating engineer, of the Cincinnati Southern, years before, made a location survey from Harriman to Knoxville which passed through the same gap in Copper Ridge as that used by the writer. He used 66-ft. uncompensated grades, and got a wonderful amount of rise and fall into his line between Copper Ridge and Knoxville, about 130 ft. of it being between Copper Ridge summit and Beaver Creek.

At the crossings of the parallel valleys of Bull Run and Beaver Creek by the Southern Railway line, the latter valley is the higher by some 140 ft.; and the writer decided to cut through Copper Ridge, by a tunnel if necessary, at the level of the upper valley, to save all unnecessary rise and fall. It was found on examination that the two valleys, though one was so much higher than the other, had practically the same rate of fall, some 30 ft. in the seven miles below the Southern Railway crossing, so that the point, *P* (see Figs. 2 and 3), in the open valley of Beaver Creek, was 140 ft. above the country at the mouth of Bull Run. At the point, *P*, however, where the stream turned and ran directly toward the only available gap in Copper Ridge, the valley began to descend much more rapidly down to the level of the Clinch. It was just possible, on the original 1 per cent. grade, to start the grade at the mouth of Bull Run and make the elevation of the upper valley by the time the summit of the ridge was reached at the gap. A cut, 68 ft. deep, containing 186,000 cu. yds. of clay, chert and rock excavation, was necessary in cutting through the ridge. Supporting ground on the side of the ridge was found from the ridge summit to the point *P* for a level grade, so the road reached *P* without any unnecessary rise and fall. A water gap in the desired direction led through Beaver Ridge. This gap drained a portion of the open valley between Beaver Ridge and Black Oak Ridge into Beaver Creek, and the three parallel valleys thus made a succession of steppes which were used to support the gradient from the Clinch to the summit of Black Oak Ridge at the lowest available gap. The alinement was excellent and the country east from the point *P* to the summit of Black Oak ridge, and from there the road descended in fairly easy country to Knoxville.

When the condensed profile was made, after the lines were tied up, it was shown that there were only three points where it had been necessary to use 53-ft. grades against southbound trains, viz., the ascent to the Cumberland Clinch divide, eight miles in length; the ascent to Black Oak ridge No. 2, 2¾ miles in length, and the ascent to Copper ridge summit, three miles in length. Up to the time of the completion of this condensed profile, none of the higher officers of the road had hoped to get any better ruling grades through this country than 1 per cent.

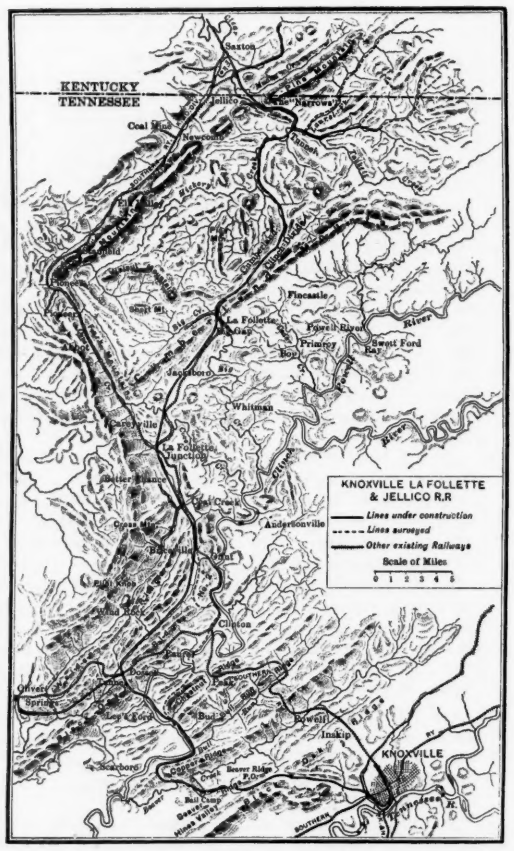


Fig. 2.—General Map, Knoxville, La Follette & Jellico.

compensated. When the writer decided tentatively on the 1 per cent. grades, the consulting engineer of the road said to him: "If you can make it from La Follette to Knoxville, on 1-ft. grades you will be doing mighty well." No other road crossing the mountains anywhere in this section of country had secured anything like such a favorable gradient as this. Lines crossing these mountains as far south as Birmingham, where the elevation of the Appalachian province is so much less, such as the Georgia Pacific line of the Southern Railway from Birmingham to Atlanta, and the Central of Georgia, Birmingham to Opelika, built in the '80s, had used 66-ft. grades.

Except the three long grades mentioned, the heaviest southbound grade was 34 ft., and the advisability of reducing these three 53-ft. grades to 34-ft. grades was at once suggested. What was the reduction worth and what would it cost?

It was plainly out of the question to reduce the ascent to the Cumberland-Clinch divide to this gradient. It was too long, and involved construction which was too expensive. If the road was to be operated on the lower grade, it was plain that a helper engine must be used on this grade, and, therefore, the cost of maintaining a helper engine would be a legitimate charge against the change to 34-ft. grades. Assuming that the traffic would be proportioned as below, and that the schedule could be arranged so that one engine crew could do the helper

*Extract from a paper, entitled "The Location of the Knoxville, La Follette & Jellico Railroad of the Louisville & Nashville System," read by W. D. Taylor, M. Am. Soc. C. E., before the American Society of Civil Engineers, March 16, 1904, Proceedings, page 126.

service, the annual cost of this service would be about as follows:

Interest on $14,000, cost of helper engine at 4 per cent.	$560
Twelve months' wages of crew, at $312	3,744
32,544 engine-miles, at a cost of 17.3 cents per mile, for repairs, fuel, water, stores and roundhousemen.	5,630
Cost of 32,544 engine-miles to maintenance of way and structures, at (22¼ per cent. of $\frac{\$1.08}{2}$) = 12 cents	3,905
Total annual cost of helper-engine service	$13,839

In the foregoing estimate, the cost of engine repairs, fuel, etc., is taken from the report of the Pennsylvania Railroad Company for 1902. It is assumed that the engine does half as much damage to the track as the train, the cost per train-mile being $108 and the cost to maintenance of way and structures being 22¼ per cent. per train-mile. We assume four round trips of 24 miles each per day, from the head of the Narrows to the end of the siding south of the divide, half the trains not running on Sunday.

Then, if the road's capital could be acquired at 4 per cent. interest, the cost of establishing and maintaining the helper service would be $345,975.

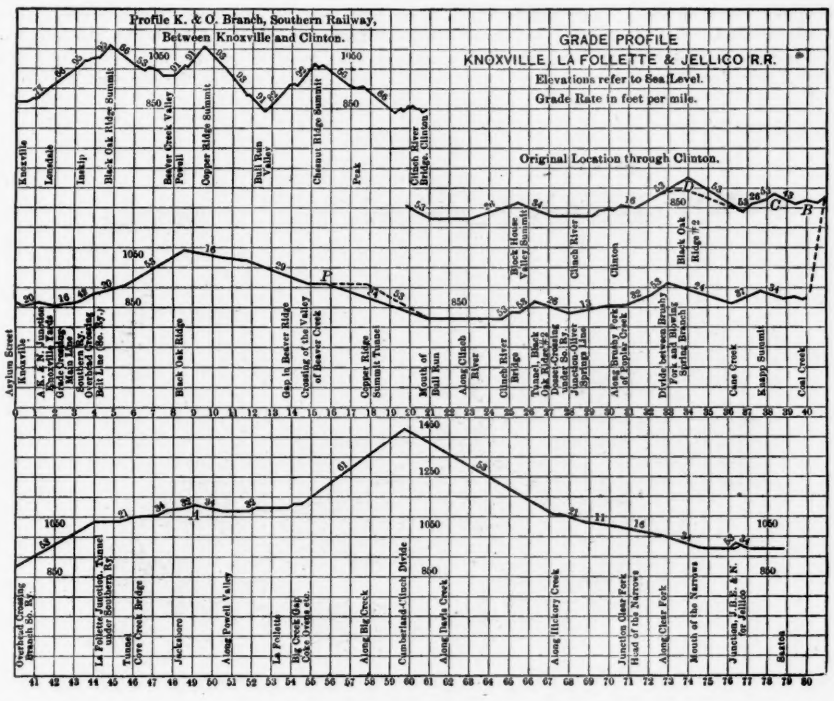


Fig. 3.—Grade Profile, Knoxville, La Follette & Jellico.

It was easily ascertained that by making a 700-ft. tunnel at Black Oak ridge No. 2 the grade there could be reduced to 34 ft. without lengthening the line and without any more expensive construction, except the cost of the 700-ft. tunnel; and, further, the tunnel would save 50 ft., vertical, of the adverse grade.

(To be Continued.)

The Motive Power Department and the Technical Graduate.

BY PROFESSOR W. F. M. GOSS.*

There are in this country approximately 60 institutions of recognized collegiate standing having students in those departments of engineering which most closely touch the interests of the railroad, namely: In Civil, Mechanical, Electrical and Chemical Engineering. In the year 1901-2 48 of these institutions, embracing certain of the so-called land-grant colleges for which statistics are available, had in attendance upon the courses named a total of 9,084 students. Full returns for that year would doubtless show a total for all institutions of between 10,000 and 12,000. Of this number, not less than 2,000 were graduated. Since 1902 the enrollment of students in most schools of engineering has materially increased, and the probability is that the number of graduates from the courses named will this year approach 2,500.

The absorption each year by the various industries of the country of 2,500 or more trained young men is a matter of no small significance. It requires no argument to show that these men include in their number many who will later have a prominent part in advancing the engineering practice of our country, and, hence, their distribution is a matter of some importance. If, for example, it were shown that some one industry receives and retains in its service a much larger share of these technical graduates than another having similar needs it would be expected that its operations would in the long run become the more efficient, and, similarly, it would appear that an industry receiving less than its share must in the end suffer through lack of technical ability. In view of these facts it is of interest to inquire whether the motive power and car departments of railroads are getting and retaining their share of the technical graduates?

It is the experience of the college authorities that the number of graduates desiring to enter the motive power and car departments is small when compared with the number which the railroad officials ask to have recommended to them. To those who have been interested in specializing the preparation of the college man for the work of such departments, this has been the source of some disappointment. But the fault is not the student's, for the student of mechanical engineering is usually predisposed to enter the railroad service. Nor is it the fault of the college, for the success of courses in locomotive design, car design and locomotive performance, as administered in the college, is shown by the comparatively large numbers of students electing them. Such subjects appeal to tastes of students and are chosen by them in anticipation of service which later they hope to render. But when the time for business comes they look the field over, and having ascertained something of the character of the various opportunities which are open to them, they generally turn from the motive power department and make their start elsewhere. Such a condition is in part due to the pressure of good times, and to the number and variety of chances which in recent years have presented themselves to the graduate, but it is none the less true that in competition the offer of the railroad has not proven attractive.

Another condition which suggests that the motive power departments of railroads do not get their share of the technical graduates is to be found in the fact that this department takes a smaller proportion of graduates in mechanical engineering than the maintenance of way departments take of the graduates in civil engineering. Basing a comparison on the last two classes which have graduated from Purdue, but 21 per cent. of the mechanical engineers have entered motive power departments while 55 per cent. of the civil engineers have entered maintenance of way departments. It may be argued that as compared with civil engineers, the mechanical engineers have presented to them a greater variety of opportunities and, hence, that a smaller percentage of the whole number follow any one pursuit. But I fancy that the principal reason is that the inducements offered him by the motive power departments are less attractive than those which are offered by the maintenance of way department.

Again, an examination of the payrolls of railroad companies will show that the number of technical graduates of the apprentice grade in the motive power and car departments is not only relatively small, but actually so. On most western roads the number is less than one to each one thousand men employed, while many roads of considerable size have no technical men in training.

These considerations, while briefly stated, constitute strong testimony favorable to the contention that railroads are not getting their share of the technical graduates for their motive power departments. There are other considerations which at first sight seem to lead to a contrary conclusion, but which when analyzed are in fact not antagonistic to those already considered. To some of these attention may now be given.

It is sometimes argued that the ideal of the motive power department discloses a two-fold purpose. On the one hand is the technical work which is the basis of all design of methods in repair and maintenance, and of all those means which are employed by the expert engineer to insure freedom from failure and economy in action. On the other hand are matters of operation, or, better perhaps, of administration, having to do with men, and with all of those matters which are essential in securing their prompt and harmonious action. The one is the work of the engineer, the other of the business man. While any motive power department must perform both of these functions, it may within limits emphasize one or the other, and evidence is not lacking which shows a tendency in present practice to slight the technical and to emphasize the administrative. It can be shown that it is only on the larger systems that any considerable amount of expert work is asked or expected of the motive power department. Such work when necessary in the design of equipment or in framing the specifications governing its construction, is in many cases offered by the supply houses and accepted by the railroad companies. When unusual improvements are to be made, outside expert help is called in. Upon many roads the motive power and car department makes no real pretense at being a technical department—it merely represents one phase of operation. In so far as the condition described applies, the fact must be recognized that the motive power department under these conditions presents no large field for the technical graduate. His place is rather with the railroad supply houses which are in effect the engineering bureaus of the railroads. While it is undoubtedly true that the process which is responsible for the present practice has reduced costs, promoted standardization of equipment, and has proven in many ways highly beneficial to railroad companies, it may well be asked whether the provisions which serve for the work of to-day are likely to be sufficient for the practice of to-morrow.

One other condition which is sometimes urged as a reason for not employing technical graduates is the difficulty which some roads allege to have in finding work for them after they have finished their special apprenticeship. It has been said by the superintendents of motive power of several roads that they had college men who had finished their probationary period, but no vacant offices to put them into. Obviously, so far as it may be a real difficulty, it constitutes an objection to the employment of considerable numbers of technical graduates. But is the difficulty real? If the technical graduate is a good man, there should be profitable work ahead. If he is not a good man, he should not have been tolerated through his special apprenticeship. Think of it! Here stands the superintendent of motive power at the head of a corps of several thousand men. He is responsible not only for its present efficiency, but for its development for future service as well. Down beside him is the college graduate who has served his time—one graduate and a thousand and perhaps fifteen hundred men who are not graduates. I am sure that no superintendent of motive power in this presence will wait for a vacancy before using the full strength of this young man. In looking over his organization, however well he may have done his work, he will see weak spots which ought not to be there; faults which may arise from the failure of a man, from the yielding of defective or of insufficient material, from a lack of a definite understanding of related facts, and having found the thinnest and least defensible spot in his whole organization, he will put his young man into it, perhaps merely as a multiplication table to a foreman whose practical training makes him valuable, but whose figures are bad; perhaps as an inspector of material or as a student of failures in material. But whatever the task, he will feel sure that if he chooses well, the young man will earn his salary and will at the same time be in training for the large responsibility when it comes.

Notwithstanding the evidence to the contrary, therefore, are we not safe in believing that the motive power and car departments need the technical graduate.

*Read before the Western Railway Club.

The Union Engineering Building in New York.

Following soon the final action of the American Society of Civil Engineers, declining to join with the other societies, Mr. Carnegie has addressed the following letter:

2 East 91st St., New York, March 14, 1904.

Gentlemen of the Mechanical Engineers; Institute of Mining Engineers; Institute of Electrical Engineers; Engineers' Club of New York:

It will give me great pleasure to devote, say, one and a half million of dollars for the erection of a suitable Union Home for you all in New York City. With best wishes, truly yours,

(Signed) ANDREW CARNEGIE.

The total amount involved is not less than $2,500,000, for, in addition to the amount given by Mr. Carnegie, a sum of over $500,000, represents the investment in land for the three societies on West Thirty-ninth street, between Fifth and Sixth avenues; while the Engineers' Club has also acquired land on West Fortieth Street, immediately facing the New York Public Library. The Union Engineering Building will probably be 12 stories high. There will be four or five auditoriums of different size, notably one to seat 1,200 to 1,500 persons. There will be an engineering museum and a library hall, where all the libraries concerned will be grouped and consolidated, yet each section administered by its respective society librarian and each adding to its own specific literature, so as to avoid duplication of outlay for books or periodicals. It is proposed to co-operate with the New York Public Library, nearby, along these lines of work, so that nowhere else in the world can the student or practitioner find thus freely available the whole literature of engineering and technical industry. The three libraries assembled in this manner will at the outset include some 50,000 volumes.

The three societies have a total membership of over 9,000, and are growing at a rate of between 10 and 15 per cent. annually. They administer a total income of $135,000 annually and in assets of all kinds have property to the value of between $250,000 and $300,000. The sister technical societies asking for quarters and facilities represent also another body of over 5,000 members, engaged in all branches of civil, mechanical, electrical, municipal engineering, etc. The Union Engineering Building will have a frontage of 125 ft. The Engineers' Club building is separate. The club, with a

long waiting list, has just increased its membership to 1,200, and has a budget of about $120,000 a year.

The three societies provide the land, but in the meantime Mr. Carnegie has acquired it for them. The leases run out about July 1 and work will then begin, with the hope of completion in 1906. The Engineers' Club has also already purchased land for itself on West Fortieth street. Plans for the architectural part of the undertaking have already been drafted, and the architects will soon be selected. The representatives of the four bodies interested as the direct beneficiaries and trustees of Mr. Carnegie's splendid gift to engineering are as follows: American Society of Mechanical Engineers—Prof. F. R. Hutton, C. Wallace Hunt, J. M. Dodge. American Institute of Mining Engineers—Dr. A. R. Ledoux, Theodore Dwight, C. Kirchhoff. American Institute of Electrical Engineers—C. F. Scott, Dr. S. S. Wheeler, Bion J. Arnold. The Engineers' Club—J. C. Kafer, W. H. Fletcher, T. C. Martin.

How to Run a Local Freight.*

BY T. H. BEACOM, *Trainmaster, C., R. I. & P. Ry.*

If a local train is scheduled regardless of whether or not time can be made, it will not take many trips to discourage the crew, who will lose heart, and when they lose heart they lose time. The division over which local freight trains are run should be short enough so as to admit of their getting over it in daylight, as there is too much time consumed in loading and unloading freight after dark. . .

Agents should give the making up of switch lists due consideration, as they can, by a little study, save a number of switches. They should not list two empties of the same kind and capacity, one, for instance, to be switched to a mill and the other to an elevator, where it would make a switch to do so, when they could be so listed as to spot them without switching. The agent or his representative should be on hand when the first car stops at the platform, to take seal records, etc. He should have all his freight to be loaded piled in a convenient place, and bills ready to deliver to conductor upon arrival. He should educate his draymen to deliver freight on the platform where it can be loaded into a passing train with the least possible delay. . . .

The conductor should be on hand and see that everything is in readiness to leave the terminals on time. He should begin to figure when leaving a terminal on making his meeting points, and should have every man on the train and engine figuring accordingly. If he expects help from the despatcher he must keep him fully advised in advance of about how much time he will consume at different stations, otherwise despatcher cannot do much for him. If the meeting point is "C" and conductor finds when he reaches "A" that there is more work than he figured on and would require a little help from the despatcher he should notify him from "A" before departing, that he could make "C" at a specified time. The despatcher should ascertain from "B" what he had for the local to do, and if he could do so without delaying important train too long, have an order ready for him at "B" to meet the train at "C"; and whenever possible the way freights should be allowed to hold the main line, especially when they cannot unload from passing tracks.

Conductor should assort his bills as soon as possible after departing. He should make a record from his bills of stations where each car is to be opened. He should also make a record of cars that are heavily loaded for certain stations, and place such cars to the platform to be worked while switching is being done.

So far as he knows, he should post his brakemen on what he has to do at each station before arrival, notifying them of heavy cars, etc. He should give his rear brakeman a record as outlined above, also furnish him a list of cars that he will be expected to load freight in.

In case he meets with delays meeting or letting more important trains pass, and he has in his train different cars containing a considerable amount of freight for any one station on his division and a smaller amount for points beyond, he should take out the smaller lot, making cars straight set-outs, and if he has time, he should transfer all freight that he may have in other cars for such stations into the set-outs. This can frequently be done during the time train is being delayed, if conditions are such that consolidating cannot be done while being delayed, time can be saved by assorting freight in the different cars for stations ahead, placing near doors in convenient place to unload. . . .

The conductor should see that his rear brakeman loses no time in getting over to assist in the unloading. He should personally look over the switch list given him by each agent before passing it to the swing man. He should be able to determine at each station, which would take the longer to do, the switching or unload and load freight, and place himself and men on the work so as to finish both about the same time.

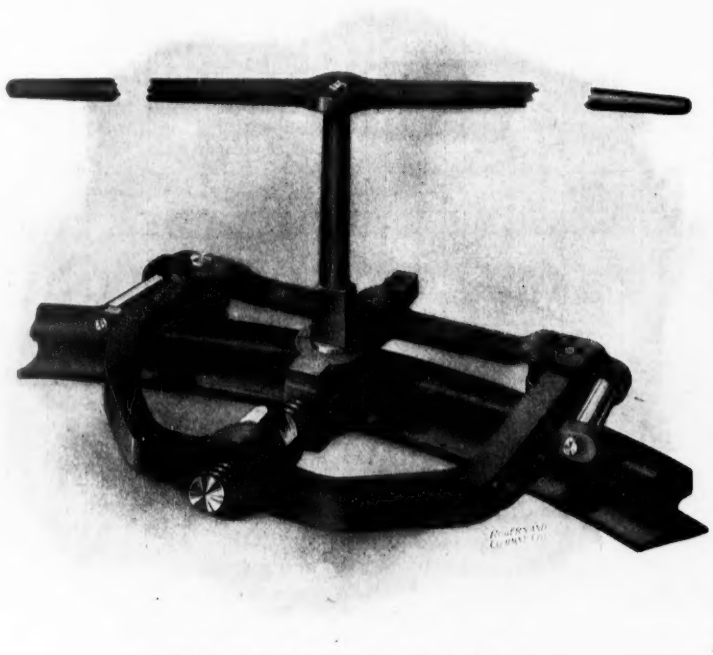
When handling freight over in cars, he should educate his brakemen to pile it so that it will be in a handy place to unload at its respective stations. In case he has a car of merchandise which contains a large amount of freight for any one station, and he cannot transfer and set it out, he can save considerable time by having one or two of his brakemen ride in the car between stations, assorting freight and piling it up close to the door ready to unload. Regular trains and engine crews should be assigned to the locals, and the crews running opposite each other should work together. In doing switching at stations, the westbound train should aim to leave eastbound cars handy for the eastbound local, and vice versa. The engineer should be alive to the necessity of making good time between stations and while doing station switching. The brakemen should be alive to the situation and enter into the spirit of push with the conductor. Local conductors should advise trainmasters of all irregularities that retard the movement of local trains, and the trainmaster should start a campaign of education along the lines that would enable the conductor and the crew, by putting forth their best efforts, to make the schedule time.

The conductor should know how to educate all concerned on his train in regard to making time and handling freight to the best advantage. The trainmaster should know whether or not the conductor knows, and be governed accordingly. A way freight conductor should be an all-round hustler. If he is, it will not take long to inject the spirit of hustling into the entire crew. However, he may be the best conductor on earth, and still take his train in late every day, unless all others concerned in the movement of way freights do their part.

*Read before the Iowa Railway Club.

The Buda Rail Bender and Straightener.

The rail bender shown in the accompanying illustration is a development of the old form of rail bender and is adapted to use on all sizes of rails. The machine is placed over the rail as shown and the nut on the center screw is turned up with a long wrench furnished with each machine until set for the desired curve. The socket wrench is then placed on the pin in the center roller and a long double lever handle put in place on top of the socket wrench stem. One or more men at each end of the lever handle can then turn the center roller which causes the machine to move along the rail, bending it as the machine moves. To straighten rails the machine is placed on the opposite side of the curve and then operated in the same way. The number of men required to operate the bender depends on the weight of rail and the amount of curvature desired. The introduction of new methods of manufacture and improved machinery has made it possible to produce this rail bender at a considerably lower cost than heretofore. It is a tool which can easily be carried by work trains and section gangs. It is made by the Buda Foundry & Manufacturing Company, Chicago, Ill.



Buda Roller Rail Bender and Straightener.

Foreign Railroad Notes.

The contracting company which is building the Simplon Tunnel down to the end of September, 1903, had expended more than $500,000 for the accommodation, protection and comfort of the tunnel employees, including barracks, laundries, baths, eating-houses, hospitals, schools and—a little graveyard, which also is a necessary attachment to an enterprise employing some thousands of men for several years.

The definite location of the Orenburg-Tashkend Railroad shows it to be 1,246 miles long. This is the third long line undertaken by Russia in Asia. It will connect Russian Turkestan and its Asiatic Midland Railroad, for some time in operation there, by a direct route with the railroad system of European Russia; but the larger part of it is through an arid or semi-arid district where, however, there are many flocks and herbs; while south of the Aral Sea in the valley of the Syr Daria, there is some very productive irrigated or irrigable land, which is generally a somewhat narrow belt. Cotton is a leading product there.

The work of railroad extension in Russia continues, in spite of the protests that it has been going on too fast, and has seriously injured the chief national industries, which were supposed to have caused the retirement of Minister de Witte. The estimates for the year 1904 contemplate the expenditure of $73,500,000 for such work, against $83,000,000 in 1903. Most of the expenditure this year is to be for lines already begun, it is true; but there are also numerous new lines provided for. Among the more important of the lines in progress is one from St. Petersburg east entirely across European Russia, which will connect with the Siberian Railroad, passing far north of Moscow. The railroad around the south end of Lake Baikal, which will complete the Siberian Railroad, required $10,000,000 last year and calls for $7,500,000 this year.

The Japanese have built a 2-ft. gage railroad from a station of an ordinary street railroad near Tokio over a very hilly and crooked route along the sea for about 20 miles to a bathing resort where there are hot springs, and the views of sea, rocks and mountains are said to exceed even the loveliest shores of the Mediterranean. The cars on this road are nearly cubical, and too low for a European of ordinary height to stand in. The first class cars seat only four passengers. These are despatched in what may be called convoys, usually of three, not coupled, but a few yards apart. In front trots the conductor, blowing a horn to warn people at crossings, etc., and the motive power on the upgrades is furnished by three men pushing each car. These, when a summit is passed, mount a footboard by which the car is entered, and so ride downhill, on the long and steep ones at a terrific speed which carries the car well up the opposite slope, and frightens the passengers (but not the coolies) half out of their wits. At the turnouts Japanese girls serve tea and fruit to passengers and trainmen alike, and on arriving at the terminus (the 20 miles are made usually in four hours) the passengers part from the conductors and wagon-pushers with many reverences.

TECHNICAL.

Manufacturing and Business.

Robert G. Holbrook, formerly a ship builder, and for a long time owner of the Vulcan Iron Works, died March 11 at Oswego, N. Y., at the age of 75.

The Interstate Bridge Co., of Kansas City, Mo., has been incorporated with a capital of $25,000 by Howard K. Webb, Paul H. Everhard and others.

The Union Steel Co., of Canton, Ohio, which was formerly a Delaware corporation, has been chartered under Ohio laws, and incorporated with a capital of $500,000.

The Buffalo Motor Car Co., of Buffalo, has been incorporated in New York with a capital of $25,000 by F. I. Alliger, of Tonawanda, F. Wende and Wm. A. Lutz, of Buffalo.

The Ansted Spring & Axle Co., of Connersville, Ind., has been incorporated with a capital of $60,000. The directors are Edward W. Ansted, George W. Ansted and Arthur A. Ansted.

Bids are wanted March 22 by the Bureau of Supplies and Accounts, Navy Department, Washington, for electric motors, hydraulic jacks, electric light plant, etc., for the Navy Yard at Norfolk, Va.

Plans have been made by the City Engineer of Milwaukee, Wis., for a $40,000 addition to the North Point water works pumping station. When completed a large pump will be added to the equipment.

The Genesee Auto-Car Co., of Rochester, has been incorporated in New York with a capital of $10,000 to make motors, etc. The incorporators are Edward A. Keena, George W. Hason and others.

The American Drop Forging & Tool Co., of Buffalo, has been incorporated in New York with a capital of $15,000 to make tools. The incorporators are Wm. A. MacFarland, Arthur G. Cruse and John A. Stillwagen.

The Seaboard Construction Co., of Brooklyn, has been incorporated in New York with a capital of $5,000 to build bridges and machinery. Former State Railroad Commissioner Ashley T. Cole is one of the incorporators.

The Metropolitan Finance Construction Co. has been incorporated in New Jersey with a capital of $200,000, to build and equip railroads and bridges. Charles N. King, W. M. Green, of Jersey City, and others, are incorporators.

The Coughlin-Sanford Switch Co., 25 Broad street, New York city, has received from the Louisville & Nashville an order for another lot of swing rail frogs and is preparing to install a number of frogs on the Pere Marquette.

The Marine Engine & Auto Motor Co., of Camden, N. J., has been incorporated in Delaware, with a capital of $500,000, to build marine engines, etc. The incorporators are J. L. Westcott and Charles A. Gallagher, of Camden, and others.

Three hundred and forty refrigerator cars being built by the Pullman Co. for the Milwaukee Refrigerator Transit Co. will be equipped with Neponset insulating paper and asphalt torsion roofs made by F. W. Bird & Son, East Walpole, Mass.

The Holme Continuous Rail Forging Co. has been organized under the laws of Pennsylvania with a capital stock of $2,000,000. The company proposes to build works at Braddock and Chicago, and has an office in the Frick Building, Pittsburg, Pa. J. Stanley Holme is President.

The Gaynor Train Control Co., of Jersey City, has been incorporated with a capital of $500,000 in New Jersey, to make railroad train controlling devices, switches, signals, etc. The incorporators are C. T. Willard and H. H. Nieman, of New York City, and A. A. Kelley, of Montclair, N. J.

David Hunt, Jr., for the past year Treasurer of the Baush Machine Tool Co., of Springfield, Mass., has been appointed general sales manager for the Warner & Swasey Co., of Cleveland, Ohio. Mr. Hunt, previous to his connection with the Baush Company, was for some years with Manning, Maxwell & Moore.

A contract has been awarded to the Brackett Bridge Co., of Cincinnati, Ohio (which bid $119,500), for building the superstructure of the new bridge over the Miami River at Elizabethtown, Ohio. It is to be a single-span bridge 586 ft. long, which, it is said, will make it the longest single-span truss bridge in the world.

Henry R. Dalton has been elected President and C. J. Wetsel, Treasurer, of the Baush Machine Tool Co., Springfield, Mass., succeeding, respectively, W. H. Baush and David Hunt, Jr. Mr. Dalton is also Treasurer and Manager of the Chapman Valve Mfg. Co. Mr. Wetsel, whose appointment takes effect March 21, is at present with the Spaulding Mfg. Co., Chicopee, Mass.

The H. W. Johns-Manville Co., of New York, has placed a new fireproofing material, to be known as "Ceilinite," on the market. It is made in pieces ⅛ in. to ⅜ in. thick, 36 in. wide and about 50 ft. long, and is especially intended for fireproofing the ceilings in electric cars, for which purpose it is being used by the Pennsylvania and the Interborough Rapid Transit Co. It may also be used for lining partitions, ceilings, side walls and every point where a flexible, fireproof barrier is required.

The St. Louis Car Co. and the Laclede Car Co., it is reported, are to be merged. The new name of the consolidated company will be the St. Louis Car Co., which will continue to operate both plants. The capital stock of the St. Louis Car Co. has been increased from $1,500,000 to $2,000,000 and that of the Laclede Car Co. has been reduced from $80,000 to $2,000. The assets of the former are given as $3,986,681 and the liabilities as $2,486,681. The assets of the Laclede Co. are given as $309,163, with no liabilities.

Iron and Steel.

The Pittsburg Steel Co., one of the largest competitors of the United States Steel Corporation, has followed the American Steel & Wire Co., in advancing the price of wire and wire nails.

At the annual meeting of the Lackawanna Steel Co., Mark T. Cox and Wm. E. Reis were elected directors. The other retiring directors were re-elected. No action was taken towards filling the office of President. The company, which, up to this time, has made only rails at its new Buffalo plant, will start its third furnace about April 10, and about May 1 will turn out finished products in all departments.

The United States Steel Corporation, it is announced, has accepted option for about 50,000 tons of additional pig iron for April delivery, making a total of 100,000 tons bought by the corporation within ten days. In addition, the corporation has bought 45,000 tons for March and April delivery from independent furnaces, and holds option for a further amount from the Bessemer Association which makes the aggregate 200,000 tons.

M. C. B. Circulars of Inquiry.

The Committee on Revision of the Standards and Recommended Practice has sent out a circular to members asking them to make known to the committee any suggestions they may have concerning necessary or desirable changes.

The Arbitration Committee expects to hold a meeting early in May to prepare its report on revision of the Rules of Interchange. Suggestions for changes are asked. In both cases replies should be sent to Secretary J. W. Taylor, 667 Rookery Building, Chicago, not later than April 1.

A Steam Engine Testing Plant.

One of the most interesting features of the new plant now being erected by the B. F. Sturtevant Company at Hyde Park, Mass., is an elaborate testing plate for engines. The plate, or more properly the plates, will be supported upon a series of heavy parallel walls between which steam and exhaust pipes are carried so that at almost any point in the entire area of the floor, measuring about 30 ft. x 60 ft., steam and exhaust connections may be made to any engine. Testing facilities will be provided, and a transfer crane overhead will make it easy to place or remove the engines. The same crane will transport them to the packing department and thence load them directly upon cars which pass through the end of the building.

The Allis-Chalmers Co.

The Allis-Chalmers Co. has entered into an agreement with the Bullock Electric Manufacturing Co. whereby the business of the two companies will be carried on as that of a single interest. The business of the Bullock Co. will be conducted as heretofore by its present management acting through a new company with the same name as the old, the Bullock Electric Manufacturing Co., organized under the laws of the State of Ohio, with Mr. George Bullock, President, and Mr. Joseph S. Neave, Vice-President. The capital stock of the Allis-Chalmers Co. is $36,250,000 and that of the Bullock Co. $3,600,000, making a combined capital stock of $39,850,000. Under the terms of the agreement, the payment of the 6 per cent. interest on the Bullock Co.'s preferred stock is guaranteed. B. H. Warren, former Vice-President of the Westinghouse Electric Co., Pittsburg, will succeed Charles Allis as President of the Allis-Chalmers Co.

Insulated Rail-Joint Patents.

Referring to the decision noted on page 198 of the *Railroad Gazette* for March 11, the G. L. H. Rail-Joint Co. says: "Our company consented to the entry of the judgment referred to, as it had been proved that a third party had put the invention into public use and therefore the same was open to the world. Any suggestion or statement that the Weber Company has any valid claims whatsoever covering the invention involved in that suit is misleading. The G. L. H. Rail-Joint Co. is prepared, as heretofore, to furnish insulated joints promptly, and is willing to give bond assuring customers against litigation or damages." In reply to this statement the Weber Railway Joint Mfg. Co. says: "It is a fact that both parties agree that claims one and two of Hall's patent No. 705,345 of July 22, 1902, relating to the insulated joint in question are void. It follows, therefore, that our company can continue manufacturing and selling such joint undisturbed. But with reference to our patent No. 738,862 of Sept. 15, 1903, we repeat the statement, that if any one makes, uses or sells the joint in question without our permission, we shall bring suit for infringement against such party, as our patent is valid, although Hall's is void for a dozen reasons."

United States Steel Corporation.

The second annual report has been issued and shows great shrinkage in earnings compared with the previous year. The following table shows the comparative income account for the fiscal year ending Dec. 31, 1903 and 1902.

	1903.	1902.
Net earnings	$109,171,152	$133,308,764
Less Appropriations for the following purposes, viz.:		
Sinking funds on bonds of subsidiary companies	1,598,012	624,064
Depreciation and extinguishment, extraordinary replacement, improvement and construction funds	23,897,353	24,150,325
Bal. of net earnings for the year	$83,675,786	$108,534,374
Deduct:		
Interest on U. S. Steel Corporation bonds	19,082,796	15,187,850
Sinking funds on U. S. Steel Corporation bonds	3,797,500	3,040,000
	$60,795,490	$90,306,524
Less:		
Charged off for depreciation in inventory valuations and for the adjustment of sundry accounts	5,378,838	.....
Balance	$55,416,652	$90,306,524
Dividends on U. S. Steel Corporation stocks, viz.:		
Preferred, 7 per cent.	30,404,173	35,720,177
Common, 2½ per cent. in 1903, 4 per cent. in 1902	12,707,562	20,332,690
United profits or surplus for year	$12,304,917	$34,253,657

The total capital stock of the United States Steel Corporation outstanding on Dec. 31, 1903, amounted to $360,281,100 of preferred and $508,302,500 of common. During the year $150,000,000 par value preferred was retired in exchange for an equal amount of 5 per cent. sinking fund gold bonds. The condensed general balance sheet shows a total bonded and debenture debt of $551,041,035 in addition to which $17,991,500 United States Steel Corporation 5 per cent. bonds were issued and sold but undelivered, and therefore not taken into account in the company's balance sheet. Mortgages and purchase money obligations of subsidiary companies aggregated $5,882,864; current liabilities, $39,540,639; sinking and reserve fund, $26,815,812, and bond sinking funds, $8,678,051. The total number of employees in the service of all the companies during 1903 was 167,709, as against 168,127 last year. Total annual salaries and wages paid amounted to $120,763,896, as against $120,528,343 last year.

New Interlocking on the Big Four.

In the extensive improvements which are being made by the Cleveland, Cincinnati, Chicago & St. Louis to prepare for the heavy passenger traffic expected during the coming summer, a part of which improvements have already been described in the *Railroad Gazette*, there are included 15 new interlocking plants, all on the St. Louis Division. Thirteen of these will have manual machines and two all-electric.

The telegraph block stations on this line are planned to be about five miles apart, stations being used where practicable and towers at other places. Most of the block stations have two passing sidings, one for eastbound trains and one for westbound, and the ends of these side tracks are interlocked and worked by the block signal operator. Where there is but one siding the entrance to it is controlled by the operator and the outgoing end has a ground switch-stand equipped with an electric lock. This lock, controlled by the towerman, is worked by a circuit running through the starting signal. The starting signals are worked manually.

The 13 manual plants are to be put in by the Pneumatic Signal Company and all of the distant signals at these plants will be of the Pneumatic Company's electric motor pattern, each worked by 16 cells of Gordon battery. The circuit controller is attached by a rod to the tail of an ordinary mechanical lever in the mechanical machine. The circuit will be so run as to insure the usual control of the distant signal by the home, and it will also work an electric indicator in the tower. As all home signals are rod-connected, there are no wire-connected manual signals whatever in these plants.

Many of these electric distant signals will stand between tracks, and for a foundation in such situations a concrete well will be used. The well will be large enough for a man to go into it, and the signal mechanism will rest on its top, the battery being placed in the well. The machines will have Saxby & Farmer improved horizontal locking. Where the machines are put into the present station buildings the lead-out is to be connected directly to the lever without the use of vertical cranks.

The all-electric plants will be made and erected by the Taylor Signal Company.

THE SCRAP HEAP.

Notes.

On the Louisville & Nashville, in Tennessee, stock cars are being converted into box cars for carrying fertilizer by lining the sides of the car with heavy fiber paper.

A bill has been introduced in the Legislature at Albany, N. Y., to authorize the New York Central & Hudson River Railroad to establish a pension and relief department.

Representative Hearst, of New York, has introduced in Congress a bill creating an Inter-State Commerce Court and authorizing the Inter-State Commerce Commission to fix freight rates.

The Interborough Rapid Transit Company, operating the elevated railroads in Manhattan, New York city, has granted an application for increased pay which will benefit 900 towermen, switch tenders, porters and track men.

According to Western papers, the literary department of the Southern Pacific, which means, we suppose, the office of the magazine published by the passenger department, is to distribute its superfluous exchanges daily to employes of the road residing in those thinly settled parts of the country where reading matter is not easy to get.

The General Manager of the Atchison, Topeka & Santa Fe has notified the employes of the company that hereafter any employe who is garnisheed will be suspended from service until the matter is settled and garnishments withdrawn. The rule has been made necessary on account of court decisions in certain States which are burdensome to the railroad company in many cases.

The New York, New Haven & Hartford Railroad Company has begun condemnation proceedings against the minority shares of the New Haven and Derby Railroad, a branch line. It is the first test case in Connecticut under a statute of disputed constitutionality which allows condemnation on the principle of eminent domain when a railroad company holds more than three-quarters of another railroad corporation's shares.

According to a press despatch from Noblesville, Ind., the Union Traction Company, operating long distance electric lines in that State, has difficulty in keeping its station agents. With the help of the profits which they can make on sales from their lunch counters and candy stores the agents make as much as 68 cents a month, and yet it is said they are dissatisfied and resign their places faster than the company can find new men to take their places.

The United States Senate has directed the Interstate Commerce Commission to transmit a report showing changes in railroad tariff rates and an estimate of the effect of such changes on the gross and net revenues during the fiscal years 1900, 1901 and 1903, as compared with the gross and net revenue that would have been derived under the rates and freight classifications in force during the fiscal year 1899, and also to report the changes in cost of operation and maintenance of said railroads for said years.

Car Ferry Steamer Burned.

The Marquette & Bessemer Dock and Navigation Company's large car ferry steamer, "Shenango No. 1," was destroyed by fire on Lake Erie off Conneaut, Ohio, on March 11. A fireman was killed and the engineer probably fatally injured. The steamer was valued at $350,000, and had a carrying capacity of 26 cars.

Adding Machines for Car Records.

The Burroughs adding machine has a new attachment by which per diem reports can be listed in such a manner as to accumulate only the days and penalty days, which are automatically and simultaneously totaled, while the car numbers are listed only. The adding machine makes a record with speed, legibility and neatness, and carbon copies are conveniently made.

Annual Passes for Station Agents.

The General Manager of the Erie Railroad has sent to each station agent of the company an annual pass, good for the agent and his wife. Each pass was accompanied by a letter calling the attention of the agent to his importance as a representative of the company. Each agent is exhorted to see that the impression which he makes on the public shall be better than ever before.

A Prize.

William James Lally, Signalman on the Erie at the east end of Bergen tunnel, Jersey City, N. J., has received from the company a gold watch and chain as a memento of his alertness in preventing a collision recently when a train overran a stop signal at his tower. An eastbound train came to a stop shortly after passing the signal, and a following train came on at such speed that it was evident that a collision must occur; but Lally quickly grasped the situation and set a switch to turn the uncontrollable train into a diverging track.

Experience in Railroad Building in Cuba.

Sir William C. Van Horne, Chairman of the Canadian Pacific, and President of the Cuba Company, who has been consulted by the Secretary of War concerning the best means of establishing railroads in the Philippine Islands, tells a reporter that it would be important to employ native workmen and to treat them with scrupulous fairness. He says the Cuba Company has adopted the policy of using Cuban labor in the construction of the railroad lines, carrying on the work under its own managers, superintendents and foremen. The construction work could have been done more cheaply if it had been let out to contractors, but the importance of avoiding any friction with the native population led the company to take the more expensive course, in the belief that this would be justified by the permanent results. A similar policy should be followed in the Philippines. Filipinos should be employed in the building of the projected lines, for only by their employment and that under scrupulously fair treatment, could the object lesson aid in effecting the vital end of uplifting the people of the islands and inspiring in them contentment and a sentiment of loyalty to the government. The railroads would unite the large centers of population and would thus tend to simplify the difficulties of preserving order in the islands. The annual cost to the government of the railroads needed for opening up the country would not exceed the annual cost of maintaining a single regiment of troops, while the completion of the railroads would, there was practically no question, so improve the present unsettled and restless condition of the Filipino people that the army of occupation could within a relatively short period be replaced by a native constabulary.

Revised Regulations for Railroad Building in China.

The following regulations and restrictions on railroad building in China, which were recently published in a consular report, show that the path of the railroad promoter among the Chinese is by no means an easy one. A special board has recently been formed to direct all questions of railroad concessions and management. Applicants for railroad building must first apply to this board for their concession. If this is granted, the company may then proceed with its surveys; but, as soon as these are completed, it must prepare maps of the proposed route, together with a complete statement of the amount of capital to be expended, and submit these for approval to the board. When application for a concession is made by a native and the company includes foreign stockholders, the application must be submitted, not only to this board, but to the board of foreign affairs as well. In no case may the foreign-owned shares be in a majority over the invested Chinese capital. If any Chinese applies for a concession and furnishes all the capital himself, amounting to more than 500,000 taels,* on the successful completion of the railroad the board will make a special petition in his behalf, conferring an extraordinary reward as an encouragement. In a case where it is found that the original capital will not be sufficient to complete the road, a petition must be sent to the board asking for permission to place a mortgage, not exceeding three-tenths of the original capital, on the machinery and property of the company. In no case will the company be permitted to mortgage its lands. Surveys must be begun within six months after the granting of a concession and grading must be started six months after the surveys are finished. The gage must be the regular English standard, 4 ft. 8½ in. As there is a dearth of railroad experts in China, a company may engage foreign officers to superintend the work, and ample protection must be afforded these officers by the local authorities. No matter whether Chinese or foreigners apply for railroad concessions, before the concession is granted the board must ascertain if the road will really be of advantage to Chinese commerce or transportation. In case of any quarrels or disturbances arising, the company, if it is a Chinese one, may apply to the nearest local official for redress. If the company is managed by foreigners, it must nominate a man to meet some one of the other party in the quarrel to arbitrate the matter. In no case will the two governments of the parties concerned be called upon to settle the dispute. When an application has been granted the company must draw up a contract and submit it to the board for approval before beginning work. If it is at any time necessary for the Chinese Imperial Government to transport troops over the railroads, they shall be given right of way and shall be carried at half rates.

*About $310,000. Present value of a tael is 62 cents.

Railroad Supplies Wanted in Syria.

The following report from our consul at Beirut, Syria, under date of December 28, 1903, may be of interest to American firms which make a specialty of furnishing railroad supplies. The Hedjaz Railway (Damascus-Mecca), with headquarters at Constantinople, is asking bids on the following equipment, including cost, insurance and freight, at Beirut: 15,000 tons of Bessemer steel rails, 21½ meter (46 lbs. per 39.37 in.); 80,000 pairs of steel fish plates; 300,000 bolts, with nuts and washers; 40 switches. Also for the following, c. i. f. Haifa: Five thousand tons of Bessemer steel rails, 25 kilograms per meter (55 lbs. per 39.37 in.); 25,000 pairs of steel fish plates; 110,000 bolts, with nuts and washers; 20 switches; 10,000 tons of iron sleepers. Hitherto the Belgians have supplied most of the material for the Hedjaz Railway, "but," remarks a Constantinople correspondent, "it has not always been the best." The undertaking has often been liberally ridiculed, yet the Turks labor on at the big work with astonishing pertinacity in spite of the innumerable difficulties they encounter. Want of money is the first and greatest. Up to the present about 70,000,000 pesetas ($2,919,000) in voluntary contributions have come in—not very much for a line 930 miles long. The Government is prepared to grant contractors offering accommodating terms special favor in the shape of concessions. The new line leads past the Dead Sea, which is a veritable treasury of important trade articles. Common salt, chlorate of potash, bromide, etc., could be taken from the water. In the neighborhood are beds of asphalt and phosphates, and petroleum, too, appears to be present. Of course, the Yafa-Jerusalem Railway would have to be extended to the Dead Sea and connected with the Hedjaz Railway wherever possible. If another breakwater were built at Yafa, so that ships could be laden and unladen even when the heavy seas were on, the traveler and pilgrim traffic would rise considerably."

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

American Society of Civil Engineers.

At the meeting of this society, held Mar. 16, in New York, a paper by W. D. Taylor, C. E., entitled "The Location of the Knoxville, La Follette and Jellico Railroad," was presented for discussion. This paper was printed in the February number of "Proceedings."

PERSONAL.

—Mr. Solomon Griffith, who died at his home in Roseville, N. J., on March 11, at the age of 82, was a veteran railroad man, having been on the Delaware, Lackawanna & Western about 25 years. Mr. Griffith began his railroad service on the New York Central & Hudson River as Supervisor of Bridges and Buildings, but left that road about 30 years ago to go to the Lackawanna. Mr. Griffith was the father of T. W. Griffith, of Syracuse; F. J. Griffith, of New York, and F. B. Griffith, of Baltimore.

—Mr. F. Hartenstien, who has been appointed Superintendent of Transportation of the Long Island Railroad to succeed Mr. Addison (General Superintendent), is about 43 years old. Mr. Hartenstien began railroad service as a brakeman on the Flint & Pere Marquette in 1880. Two years later he was made conductor, and in April, 1897, was appointed Assistant Trainmaster. The following month he became Trainmaster and two years ago General Trainmaster. In April of that year (1902) Mr. Hartenstien resigned and took a similar position (Trainmaster) on the Long Island, from which position he is now promoted to that of Superintendent of Transportation.

—Mr. Horace G. Burt, late President of the Union Pacific, is reported to have accepted an important railroad position under the Russian Government. It has been commonly reported in the daily newspapers that he resigned the presidency of the Union Pacific for the purpose of entering the Russian Railroad service. This much, at least, is untrue. He resigned for other reasons, and embraced the opportunity to rest and travel around the world, expecting to spend about two years in that way. It may, however, possibly be true that he has since then undertaken to do some special work, to the end of making the Siberian and Manchurian railroads more competent for the purposes for which they were designed.

—Mr. John R. Slack, who has been appointed Assistant to General Superintendent Stone, of the Delaware & Hudson Company, has for two years been Superintendent of Motive Power of that road. Mr. Slack was a student at Columbia College and later at Stevens Institute of Technology, and is about 41 years old. His early railroad training was on the New York Central & Hudson River, and in 1890 he became Inspector of Locomotives and Mechanical Engineer. In 1899 he was promoted to be Assistant Superintendent of Motive Power of the Delaware & Hudson, and three years later was made Superintendent of Motive Power, from which position he is now promoted to be Assistant to the General Superintendent.

—Mr. Arthur J. Slade, late Mechanical Engineer of the New York Central & Hudson River, has opened an office for designing and supervision of engineering work at 4 East Forty-second street, New York city. Mr. Slade is a graduate of Yale University, class of 1892, and in 1894 he was a special student in electrical engineering at Columbia University. For six years, from 1894, he was engaged in engineering work on buildings, prominent among which were the Dunmore shops of the Erie Railroad. Mr. Slade was also in charge of construction of the Elizabethport shops of the Central Railroad of New Jersey, and in March, 1902, he entered the engineering department of the New York Central, later being promoted to be Mechanical Engineer.

—Mr. Frank R. Coates, Chief Engineer of the Chicago Great Western, has resigned from that position to enter the firm of Thomas Fee & Company, railroad contractors, of Chicago. Mr. Coates was born in Philadelphia in 1869. He graduated from Lehigh University at Bethlehem, Pa., in 1890, and the next year took a post-graduate course. His first railroad service was in 1891, when he began as a transitman on the Baltimore & Ohio. From 1892 to 1893 he was a supervisor on this road, and in May, 1893, he went to the New York, New Haven & Hartford, where he was Assistant Roadmaster and then Roadmaster on the New York division. In October, 1899, he left this road and went to Chicago as Western Manager for the Weber Rail Joint Manufacturing Company, and the next year (1900) took the position he now leaves, that of Chief Engineer of the Chicago Great Western.

ELECTIONS AND APPOINTMENTS.

Arizona & Utah.—N. W. Tarr, Superintendent, with headquarters at Kingman, Ariz., has resigned.

Buffalo, Rochester & Pittsburg.—The headquarters of J. C. Hyde, Superintendent, will on April 1 be removed from Butler, Pa., to Punxsutawney, Pa.

Canadian Pacific.—See Delaware & Hudson.

Chicago Great Western.—F. R. Coates, Chief Engineer, with headquarters at St. Paul, Minn., has resigned, and A. Munster, Bridge Engineer, will assume the duties, temporarily.

S. O. Brooks, General Freight Agent, has resigned. (See Pere Marquette.)

Choctaw, Oklahoma & Gulf.—S. H. Johnson has been appointed Assistant General Freight Agent, with headquarters at Little Rock, Ark., succeeding A. H. McDonald, resigned on account of ill health.

Delaware & Hudson.—J. R. Slack has been appointed Assistant to the General Superintendent. J. H. Manning, hitherto Second Assistant Superintendent of Rolling Stock of the Canadian Pacific, has been appointed Superintendent of Motive Power of the D. & H., succeeding Mr. Slack.

P. H. Connors, Superintendent of the Susquehanna Division at Oneonta, N. Y., has resigned.

Delaware, Lackawanna & Western.—R. F. McKenna, hitherto Superintendent of Car Shops, has been appointed Master Car Builder, with headquarters at Scranton, Pa., reporting to the Superintendent of Motive Power and Equipment. Mr. McKenna will have general supervision of all Car Department work on the system, and have charge of such other matters of the Car Department as may be assigned to him by the Superintendent of Motive Power and Equipment. The position formerly held by him has been abolished.

Erie.—See Ulster & Delaware.

Genesee & Wyoming.—The position of General Freight Agent has been abolished. The General Manager assumes the duties.

Illinois Central.—The jurisdiction of G. H. Groce, Superintendent of Telegraph, and G. M. Dugan, Assistant to the Superintendent of Telegraph, has been extended over the Yazoo & Mississippi Valley.

Interoceanic Railway of Mexico.—H. M. Taylor has been appointed General Manager, with headquarters at Mexico, Mex., succeeding W. L. Morkill, resigned.

Mississippi River, Hamburg & Western.—The jurisdiction of K. G. Morley, Superintendent of the St. Louis, Iron Mountain & Southern at Mer Rouge, La., has been extended over the M. R., H. & W. R. E. Cahill has been appointed Assistant Superintendent, with headquarters at Lake Village, Ark.

New York, New Haven & Hartford.—S. Higgins, hitherto Mechanical Superintendent of the Southern, has been appointed General Manager of the N. Y., N. H. & H., with headquarters at New Haven, effective April 1. Mr. Higgins succeeds W. E. Chamberlain, resigned.

Norfolk & Western.—Paul Scherer, Immigration Agent, has been appointed Agricultural and Industrial Agent, an Agricultural and Industrial Department having just been established. Mr. Scherer's office will be at Roanoke, Va.

Northern Pacific.—C. S. Fee, General Passenger Agent, has resigned. (See Southern Pacific.)

Pennsylvania Company.—At a meeting of the Board of Directors held recently, E. B. Morris was elected a Director, succeeding L. F. Loree, resigned.

Pere Marquette.—S. O. Brooks, hitherto General Freight Agent of the Chicago Great Western, has been appointed General Freight Agent of the P. M., with headquarters at Chicago, Ill.

A. R. Merrick, hitherto Trainmaster, has been appointed Superintendent of the Saginaw District, with headquarters at Saginaw, Mich., succeeding W. H. Stillwell, resigned.

The business heretofore conducted in Canada in the name of the Lake Erie & Detroit River is now conducted by and in the name of the Pere Marquette (except as to the line between London & Port Stanley), pursuant to a trackage contract between the L. E. &

D. R. and the P. M. The jurisdiction of the general officers of the P. M. has been extended to cover the business in Canada of the P. M., and the lines to be thus operated will be known as the Buffalo Division.

St. Louis, Iron Mountain & Southern.—See Mississippi River, Hamburg & Western.

Southern Pacific.—E. O. McCormick, hitherto Passenger Traffic Manager, has been appointed Assistant Traffic Director of the Harriman lines. The Harriman lines include the S. P., the Union Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Company. Mr. McCormick's office will be in Chicago. C. S. Fee, hitherto General Passenger Agent of the Northern Pacific, has been appointed to succeed Mr. McCormick at San Francisco.

Terminal Railroad Association of St. Louis.—J. A. Shepherd has been appointed Assistant Superintendent, with headquarters at St. Louis, Mo.

Texas Southern.—N. P. Turner has been appointed Chief Engineer with headquarters at Marshall, Texas.

Ulster & Delaware.—M. R. Coutant, hitherto Division Master Mechanic of the Erie, has been appointed Master Mechanic of the U. & D., with headquarters at Rondout, N. Y.

Union Pacific.—See Southern Pacific.

Yazoo & Mississippi Valley.—See Illinois Central.

LOCOMOTIVE BUILDING.

The Lehigh Coal & Navigation Co. is having two locomotives built at the Baldwin Locomotive Works.

The Southern Ry. is having ten locomotives built at the Richmond Works of the American Locomotive Co.

F. M. Hicks, of the Hicks Locomotive and Car Works, has sold the following equipment: Waterloo & Cedar Falls Rapid Transit, two locomotives; Butterfield Lumber Co., one locomotive, and Arizona Southern, one 55-ton consolidation locomotive.

The Louisville & Nashville has ordered five simple six-wheel switching locomotives from the Baldwin Locomotive Works, for June delivery. These locomotives will weigh 145,000 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 52 in.; boiler pressure, 180 lbs.; grate area, 33 sq. ft.; and tank capacity, 4,000 gals. of water. The special equipment includes Westinghouse air-brakes.

The Minneapolis, St. Paul & Sault Ste. Marie, as reported in our issue of March 4, has ordered eight simple Pacific (4-6-2) locomotives from the Schenectady Works of the American Locomotive Co., for July delivery. These locomotives will weigh 195,000 lbs., with 129,000 lbs. on the drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 69 in.; extended wagon-top boilers, with a working steam pressure of 200 lbs.; heating surface, 2,996 sq. ft.; 288 iron tubes, 2 in. in diameter and 18 ft. 6 in. long; firebox, 90 in. long and 70 in. wide; grate area, 43.75 sq. ft.; tank capacity, 6,000 gals. of water and coal capacity, 10 tons. The special equipment includes: Westinghouse air-brakes, Franklin boiler lagging, Monarch brake-beams, Washburn couplers, Ohio injectors, Monarch journal bearings, Paxton-Mitchell piston rod packings, Crosby safety valves, Chicago sight-feed lubricators, Midvale driving-wheel tires and steel wheel centers.

CAR BUILDING.

The Massillon Coal Co. is figuring on 1,000 coal cars.

The Seaboard Air Line is asking bids on 1,000 box cars.

The American Car & Foundry Co. has miscellaneous orders for 50 cars.

The Boston & Albany is having four coaches built by Osgood, Bradley & Sons.

The Delaware, Lackawanna & Western is having eight coaches built by Barney & Smith.

The Barber Asphalt Paving Co. has ordered 60 steel cars from the American Car & Foundry Co.

The City of Winnipeg, Manitoba, has ordered 86 ballast cars from the American Car & Foundry Co.

The American Refrigerator Transit Co. has ordered 500 refrigerator cars from the American Car & Foundry Co.

The Chicago & North Western has ordered 500 box cars from Haskell & Barker and 500 box cars from the Pullman Co.

The National Despatch Line, Chicago, is having 200 freight cars built at the Chicago Works of the American Car & Foundry Co.

The Pittsburg, Shawmut & Northern has ordered 800 freight cars from the Berwick, Pa., shops of the American Car & Foundry Co.

The Mobile & Ohio has ordered 2,270 freight cars, divided between the American Car & Foundry Co. and the Mount Vernon Car Mfg. Co.

The Chicago, Burlington & Quincy has ordered four 40-ft. metal tank cars of 100,000 lbs. capacity from the American Car & Foundry Co.

The Producers' Tank Lines have, it is reported, placed an order for repairing and remodeling their entire equipment with the Georgia Car & Mfg. Co.

The El Paso & Southwestern has ordered 30 pressed-steel side-dump ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co. These cars are to be delivered within the next 60 days.

F. M. Hicks, of the Hicks Locomotive and Car Works, has sold the following equipment: Midland Valley, four passenger coaches, two combination cars and two baggage cars; Waterloo & Cedar Falls Rapid Transit, two coaches and one combination car; Copper Range, four coaches and two combination cars; Louisiana & Northwest, one passenger coach.

The Southern has ordered six combination mail and baggage cars from the Wilmington, Del., shops of the American Car & Foundry Co., for June delivery. The cars will be 60 ft. long, 9 ft. 8½ in. wide, and 14 ft. 3 in. high, from rail to top of roof. The special equipment includes: Open-hearth steel axles, Diamond special brake-beams, cast-iron brake-shoes, Westinghouse air-brakes, Ajax brasses, Southern Railway standard door fastenings, paint and four-wheel trucks; Harrison dust guards, Gold straight steam heating system, McCord journal boxes, Pintsch gas, Standard Coupler Co.'s steel platforms, Steel Tired Wheel & Spring Co.'s springs, Buhoup couplers and vestibules and McKee, Fuller Co.'s wheels.

BRIDGE BUILDING.

BEAUFORT, S. C.—Bids are wanted, April 4, for building a bridge of two spans each 70 ft. long; also a 50-ft. bridge with concrete bulkheads.

BLUFFTON, IND.—We are told that bids are being asked by the County Commissioners for 10 bridges, two of which are to be concrete arches. C. S. Brineman is Auditor.

COUNCIL BLUFFS, IOWA.—The Central Bridge & Railroad Co. has been incorporated with a capital of $100,000 to build a bridge over the Missouri River at Council Bluffs.

DURANGO, MEX.—A number of bridges over the Acequia Grande River will be rebuilt.

EAU CLAIRE, WIS.—A new bridge may be built over Chippewa River of three spans about 400 ft. long. John C. Fennessey is City Clerk.

ELYRIA, OHIO.—The city will build a bridge to cost about $25,000.

FARGO, N. DAK.—The United States Senate, on March 12, passed the bill authorizing a bridge across the Red River of the North, at Fargo, N. Dak., which had been previously passed by the House of Representatives.

FREDERICTON, N. B.—Bids will be received by C. H. La Billois, Chief Commissioner, Department of Public Works, April 1, for steel superstructures for the following bridges: 143-ft. through truss span for Hall's Creek bridge, Moncton; 52-ft. through truss span for Harshman's bridge, Shediac; 188-ft. through truss span for Norton station bridge.

GODERICH, ONT.—Plans have been made for rebuilding the Maitland Bridge at Goderich.

GREENVILLE, OHIO.—The County Commissioner is considering the question of building a bridge on Broadway over Greenville Creek, to cost about $12,000.

GROVE, IND. T.—The Grove Bridge Co. will build a steel wagon bridge over Grand River at Kerry's Ferry to cost about $30,000.

HARRISBURG, PA.—Viewers have been appointed for the proposed State bridge over the Susquehanna River between Berwick and Nescopeck.

HYDE PARK, MASS.—Surveys are being made for a concrete arch bridge to be built by the Park Commission to connect Milton with Hyde Park.

KANSAS CITY, KAN.—The Missouri Pacific has decided to rebuild the wagon viaduct over its tracks from Riverview to Central avenue. It is to be about 1,000 ft. long, and to cost $75,000.

MINNESOTA.—The United States Senate, on March 8, passed the bill declaring a portion of the Minnesota River not navigable and authorizing various bridges over it in Minnesota.

NEW BRUNSWICK, N. J.—Plans are being made for a new bridge to replace the Three-Mile Run Bridge.

NEWARK, N. J.—On March 4 a bill was introduced in the Lower House of Congress authorizing a bridge across Newark Bay.

NEW YORK, N. Y.—On March 2 a bill was introduced in the United States Senate authorizing the Spuyten Duyvil & Port Morris R. C. Co. (N. Y. Central) to build bridges over Spuyten Duyvil Creek and the Harlem River, north of Harlem River pier and bulkhead lines as now established in New York City.

N. DAKOTA.—The United States Senate, on March 9, passed a bill authorizing a bridge over the Missouri River between Wanbliska, Burleigh County, and Morton County, N. Dak., the plans, location and operation to be subject to the approval of the Secretary of War.

OTTAWA, ONT.—The City Council has under consideration the question of building a viaduct on Richmond road to replace a level crossing. The City Engineer has plans ready.

PARKVILLE, MO.—In the United States Senate an amendment to the act authorizing the building of the bridge over the Missouri River at Parkville was introduced which directs that the act shall become void unless work is commenced on the bridge by April 1, 1907, and completed by 1909.

PAWTUCKET, R. I.—An act authorizing the city to borrow $60,000 for bridge purposes has been introduced in the State Legislature.

PENNSYLVANIA.—In consequennce of the disastrous floods in the Susquehanna River and other streams, following the breaking up of big ice gorges, it is estimated that the State will be required to replace bridges at a total outlay of over $1,000,000. The State has already spent over $1,000,000 in building bridges destroyed by flood or fire under the Act of 1895. The bridges destroyed wholly or in part by the late floods include the following: At Berwick, six spans, $100,000; Mifflinville, $10,000; Danville, five spans, $85,000; Sunbury, 4,300 ft. long, $100,000; Catawissa, two spans gone, $25,000; Catawissa Creek at Long Hollow, $15,000; Skinner's bridge over same creek, $10,000; Breisch's bridge at McCauley, $12,000; bridge over Catawissa Creek at Catawissa, $15,000; P. R. R. bridge over Black Creek, $10,000; two wagon bridges over same creek, $20,000; bridge over Nescopek Creek, one mile above Nescopeck; bridge over same creek at Evansville; bridge over same creek at Zenith; temporary bridge over Lehigh River at Allentown, to be soon replaced by a State bridge; bridge over Catawissa Creek at Mainville; railroad bridge of Pentecost Lumber Co. at Elk Grove, also two spans of bridge of same company near Central; bridge over Brush Creek near Saltsburg; bridge over Connoquenessing Creek at Zehonopole; two bridges over Breakneck Creek at Callery; bridge over Dan's Run in Butler county; bridge over Thorn Creek in same county; bridge below Sarversville; two bridges over Glade Run, Butler county; two bridges over Connoquenessing Creek in Butler county; bridge over Thorn Creek at Renfrew; two bridges in Winfield township, Butler county; bridge over Slippery Rock Creek at Tannadale; bridge near Evans City; bridge (trolley) over Conestoga Creek near Millersville; bridge over Kiskiminetas River at Hyde Park; bridge over Thompson's Run at Turtle Creek; bridge over Sivotara Creek in Lebanon county; Bessemer & Lake Erie Railroad bridge over Big Lee Creek near Bessemer; bridge over Buffalo Run at Bellefonte.

The State will build many of the above bridges. All are to be replaced with new structures, meaning a very busy season for the bridge builders. The bridges at Long Hollow and Mainville had only recently been built by the State at a cost of $15,000 each. It is reported that the Standard Oil Co. will build a bridge across the Susquehanna River to carry its pipes instead of relaying the line in the river bed.

PITTSBURG, PA.—The Secretary of War has ruled that the Wabash must build its bridge at Fourth street, 70 ft. above the river.

PORT CLINTON, OHIO.—Bids are wanted, March 28, by the County Commissioners for building the superstructure of a bridge over Young's Bayou of 100-ft. span, with 16-ft. roadway; also the superstructure of a bridge over Toussaint River, 200 ft. long, with 16-ft. roadway, and for repairing the superstructure of the bridge over Portage River at Oak Harbor, in Ottawa County. Henry Pafenbach is County Auditor.

PROVIDENCE, R. I.—The City Council has under consideration the question of building a viaduct from Market square to Corner street, at a cost of $200,000.

ST. JOHN, N. B.—The Canadian Pacific, it is reported, will build about 29 new bridges and culverts, 10 on the main line, and 19 on the other lines, to cost about $140,000.

SALEM, OHIO.—The Salem & Eastern Railway Company will build a bridge 110 ft. long over the Pennsylvania tracks, also a trestle about 800 ft. long.

SHARON, PA.—The Pennsylvania, the Erie Railroad and others will jointly build a viaduct on Budd avenue, to cost about $80,000.

SPRINGFIELD, OHIO.—The Board of Public Surveys will build a concrete bridge on Bechtle avenue, to cost about $18,000.

SPRINGHILL, PA.—Viewers have recommended the building of a new bridge over Camp Run in Springhill.

SYRACUSE, N. Y.—The Delaware, Lackawanna & Western has given a contract for building the superstructures of about 59 bridges, to be built at various points along its Syracuse and Utica Divisions, to the American Bridge Company. The company's forces will build the substructures. The total cost will be about $1,000,000.

TEXAS.—In the House of Representatives on Feb. 29 a bill was introduced authorizing the Lawton, Wichita & Gulf Ry. Co. to build a bridge over Red River, on the boundary line between Texas and the Territory of Oklahoma.

TOLEDO, OHIO.—The Lake Shore and the city may jointly build a bridge over the railroad tracks at Oak street.

UTICA, N. Y.—A bill will be introduced in the State Legislature authorizing the building of a lift bridge at Seneca street.

VANCOUVER, B. C.—The Canadian Pacific will replace many trestles on its main line near Kamloops, B. C., with steel bridges.

WASHINGTON, D. C.—As passed by the House of Representatives on March 3 the District of Columbia appropriation bill authorizes repairs to the bridge over the Anacostia River at Washington, D. C., amounting to $250,000, to be completed by July 1, 1906, and appropriates $100,000 for that purpose to be used during the next fiscal year.

WEST VIRGINIA.—On March 13 the House of Representatives passed bills authorizing the Norfolk & Western Railway Co. to build bridges over the Tug Fork of Big Sandy River where it forms the boundary line between West Virginia and Kentucky, and West Virginia and Virginia.

WILLIAMSPORT, IND.—Warren county will build two stone and iron bridges, one at Williamsport and one at Independence, each 800 ft. long, to cost about $90,000, for which bids will soon be asked by R. L. Winks, County Auditor.

Other Structures.

ALEXANDRIA, LA.—The Texas & Pacific has under consideration the question of building a $30,000 passenger station.

ATLANTA, GA.—The Atlanta Terminal Company has awarded a contract to the American Bridge Company, at $80,000, for the structural work on the train shed of its new passenger station.

CHESTERFIELD, IND.—The Cleveland, Cincinnati, Chicago & St. Louis and the Pittsburg, Cincinnati, Chicago & St. Louis will jointly build a new passenger station.

CHATTANOOGA, TENN.—The Cincinnati, New Orleans & Texas Pacific will enlarge its machine shops at Chattanooga.

COLUMBUS, GA.—The Seaboard Air Line, it is reported, will build large shops in Columbus.

KANSAS CITY, KAN.—The Union Pacific, it is reported, is making plans to enlarge its shops in Kansas City.

KNOXVILLE, TENN.—The Louisville & Nashville has secured a building permit to put up a new passenger station to cost about $100,000, at the corner of Asylum avenue and Broadway.

LEAVENWORTH, KAN.—The Chicago Great Western, reports say, will build a new passenger station in Leavenworth.

LEBANON, IND.—The Indianapolis & Northwestern Traction Co. is asking bids for building brick repair shops, to cost about $20,000.

MEXICO CITY, MEX.—The railroads have under consideration the question of building a new union passenger station which, local reports state, will soon be built.

MONTREAL, QUE.—Bids will be received by the Chief Engineer, Montreal Harbor Commissioners, April 22, for building fourteen steel sheds on the wharves at Montreal, four to be completed within six months after the contract has been let, five to be commenced by Oct. 15 and completed by May 1, 1905, and the remaining five to be commenced by Oct. 15, 1905, and completed by May 1, 1906.

NASHVILLE, TENN.—The Tennessee Central, it is reported, will build a new freight house to cost about $40,000.

RENSSELAER, IND.—The Chicago, Indiana & St. Louis will build a stone passenger station 65 ft. long.

SCRANTON, MISS.—The Louisville & Nashville, it is reported, will build a new station and warehouse.

STAUNTON, VA.—The Chesapeake & Ohio is arranging to build a new passenger station at this place.

WASHINGTON, ILL.—The Toledo, Peoria & Western will build a brick and stone passenger station at Washington, to be used also by the Chicago & Alton.

WINNIPEG, MAN.—The Canadian Pacific will soon ask bids for building a concrete subway on Main street; also for a new station and hotel. J. E. Schurtzer, Division Engineer, has charge of the subway plans.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTIC & WESTERN.—This company has been incorporated in West Virginia to build from South Cumberland, Mineral county, W. Va., southwest to the Ohio River, near Huntington. A. C. Dennis, J. B. Hart and J. W. Williams, Clarksburg, W. Va., are incorporators.

ALABAMA NORTHERN.—A charter has been granted this company in Alabama with a capital stock of $50,000. The proposed route of the road is not stated. C. B. Allen, E. A. Phelps, J. W. Jackson, B. W. Pruett and others are incorporators.

ATLANTIC COAST LINE.—It is reported that this company is about to build a branch from Washington, N. C., south to Newbern, 30 miles. This proposed branch was authorized at a meeting of the directors in 1903. It is stated that the company will also begin surveys for locating an extension from Suffolk, Va., southeast to Elizabeth City, N. C., 35 miles.

BOCA & LOYALTON.—The proposed route of this road is from Boca, Cal., in a northwesterly direction to Quincy, 80 miles, passing through Beckwith Pass, Spring Garden Creek and Spanish Creek, with a branch line from Beckwith Pass to a point at the head of Indian Creek in Plumas county, 30 miles. J. W. Roberts, P. J. Harney and R. H. Lewis, of Boca, Cal., are incorporators. (See Construction Supplement.)

BOSQUEVILLE R. R.—Press reports state that surveys have been made and arrangements completed for building a railroad from Waco, Tex., via Bosqueville and Meridian to Stephenville, 80 miles. P. A. McCarthy, Lufkin, Tex., may be addressed.

CANADIAN PACIFIC.—This company is reported to have decided to build a number of extensions during the present year. The Pheasant Hill branch, which is now graded as far as Haywood, will be extended west to the northern boundary of Manitoba. Two branch lines will also be built, each 25 miles long; one from the Calgary & Edmonton in an easterly direction, and the other from Wetaskiwin. The branch line from Arcola, N. W. T., on which 40 miles of track have been laid, will be completed through eastern Assiniboia, a distance of 115 miles. It is also stated that work will soon be begun on the new terminals of the company at Winnipeg, Man.

CECIL & ASTOR.—A charter has been granted this company in West Virginia. It is proposed to build a railroad between these two points, a distance of eight miles. C. A. Young, Robson, W. Va.; W. T. Gates, Astor, W. Va., and W. J. Elgin, Kanawha Falls, W. Va., are incorporators.

CINCINNATI, HAMILTON & DAYTON.—Press reports state that as soon as the weather permits work will be begun on a branch line from Delphos, Ohio, south to Mandale, 13 miles. This new branch will give the company a more direct line from Cincinnati to Fort Wayne.

DARIEN & WESTERN.—This company is about to begin work on two extensions, one east from Darien, Ga., to deep water at Darien Harbor, and the other in a westerly direction to a connection with the Atlantic Coast Line.

DELAWARE, LACKAWANNA & WESTERN.—Plans have been approved by the city officials of Newark, N. J., for abolishing the Clifton avenue grade crossing and for depressing the railroad tracks at that point. It is stated that the plan which necessitated the removal of a section of the Morris Canal and the construction of an incline plane to convey canal boats over the tracks at Orange street has been abandoned and that the railroad will begin the depression of its tracks at High street, thereby eliminating all the grade crossings through Newark.

EASTERN IOWA.—This company has been organized in Iowa to build a number of electric lines in the vicinity of Cedar Rapids. A. F. Groeltz is President and W. W. Chamberlain, Secretary, both of Cedar Rapids.

FORT SMITH & WESTERN.—Surveys have been completed and rights of way are now being secured for a branch line from the Indian Territory boundary line to Coal Creek, Ind. T., 20 miles. Contracts for grading have not yet been let. H. A. Schwanecke, Fort Smith, Ariz., is Chief Engineer.

GARBUTT & DONOVAN SHORT LINE.—A charter has been granted this company in Georgia to build from Stillmore on the Millen & Southwestern south through Montgomery county to Lyons, 16 miles. R. M. Garbutt and D. O. Donovan are incorporators.

GRANGER, GEORGETOWN, AUSTIN & SAN ANTONIO (M. R. & T.).—Grading has been completed on this road from Georgetown south to Austin, 25 miles, and track laying is now in progress. The road was completed between Georgetown and Granger, 18 miles, in May, 1903. The character of the work is light, with a maximum grade of 1 per cent. and a maximum curvature of 3 deg. It is stated that as soon as the line is completed to Austin it will be extended to a connection with the San Antonio & Aransas Pass at San Marcos, Tex. S. P. Fisher, St. Louis, Mo., is in charge of the work.

GREAT NORTHERN.—This company has announced that the line between Jennings, Mont., and Kalispell will be abandoned on Sept. 1. The new cut-off which the company is building from Columbia Falls, Mont., west to a connection with the Fernie branch at a point north of Jennings will be open for traffic about Sept. 1. (See Construction Supplement.)

GREAT SOUTHERN.—Articles of incorporation have been filed by this company in Oregon. It is proposed to build from The Dalles, Ore., to Dufur, 30 miles. W. F. Nelson, Seattle, Wash., and John G. Heimrich are incorporators.

GULF & INTERSTATE.—An officer writes that this company has no intention of building an extension from Winnie, Tex., to Lufkin, 115 miles. (Feb. 19, p. 136.)

HOLTON R. R.—An officer writes that work is now in progress on this road from Holton, Cal., to Imperial, 12 miles. Grading is practically completed and track laying will be begun at once. The work is easy. It includes one wooden trestle 225 ft. long. H. F. Holt, Redlands, Cal., is President. (See Construction Supplement.)

IMBODEN & ODELL.—It is reported that grading is practically completed on the first 12 miles of this proposed road from Blue Creek, W. Va., east to Summersville, 35 miles. The remainder of the road has been located and it is stated that contracts for this section will be let as soon as the estimates have been drawn up. C. P. Peyton, Charleston, W. Va., is Chief Engineer. (See Construction Supplement.)

INTERNATIONAL & SOUTHERN.—Incorporation is being asked from the Dominion Parliament for a company to build from Savanne, Ont., on the Canadian Southern, via Kashabowie, to a point near Hunters' Island, on the international boundary line between Ontario and Minnesota, a distance of 90 miles. D. Mills, Port Arthur, Ont., is acting for the promoters. Surveys for this line were made in 1903 in the interest of Messrs. Mackenzie, Mann & Co.

JOLIETTE & LAKE MANUAN.—Application is being made at the current session of the Dominion Parliament for an act authorizing this company to build from Joliette, Que., south to Montreal, 40 miles, with several branches.

KANSAS SOUTHERN (ELECTRIC).—This company has been incorporated in Kansas to build an electric line from Kansas City to Bassett, Kan., with several branch lines, about 170 miles in all. F. V. Crouch, Iola, Kan., may be addressed.

KLAMATH LAKE.—It is reported that surveys have been completed for an extension of this road from Pokegama, Cal., in an easterly direction for 25 miles. H. Lindley, Klamathon, Cal., may be addressed.

LAKE SUPERIOR & NORTHERN.—Articles of incorporation have been filed by this company in Minnesota. It is proposed to build a number of logging roads throughout the State. H. P. Gardiner is Secretary and L. R. Martin is President.

LOUISVILLE & NASHVILLE.—It has been officially announced that the extension of this road from Altoona, Ala., east to Attalla, 17 miles, is practically completed and that the line will soon be open for traffic. (See Construction Supplement.)

METEOR MOUNTAIN.—Articles of incorporation have been filed by this company in Arizona. It is proposed to build from Dennison, Ariz., on the Atchison, Topeka & Santa Fe in a southerly direction to the mines of the Standard Iron Co., 40 miles, with a branch line from Sunset southeast to the mines of the same company, a distance of 10 miles. E. B. Knox, B. L. Clark and others, of Dennison, Ariz., are incorporators.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—A contract has been awarded to Foley Bros., Larson & Co., of St. Paul, Minn., for finishing the grading on the Glenwood extension from Ottertail, Minn., to the boundary line at Emerson, 200 miles. Work will be begun at both ends at once, and it is stated that the line will be completed by Nov. 1 next. The extension is now in operation between Glenwood and Ottertail, 59 miles.

MINNESOTA CENTRAL.—Press reports state that work will be begun on April 1 on this new road from Mankato, Minn., northeast through St. Cloud to Duluth. C. E. Coon & Co., Houston, Tex., are the contractors. E. H. Mackenzie, Gaylord, Minn., may be addressed. (See Construction Supplement.)

MOREHEAD & WEST LIBERTY.—It is reported that this company will soon resume work on its proposed line from Morehead to West Liberty, Ky., 25 miles. Four miles were completed in 1901 and the line was then abandoned on account of a lack of funds. It is stated that money has now been provided and that work will be begun at once. E. B. Carr, West Liberty, Ky., is General Manager. (May 8, p. 336.)

NEW YORK & JERSEY (TUNNEL).—This company has successfully joined the two headings of its north tunnel between Jersey City and foot of Morton street, New York city. A party of officers walked through the tunnel on March 12. There is still a good deal of work to be done, however, and the tunnel will not be opened for traffic for at least a year. It will be used for light electric cars and will connect the lines of the Public Service Corporation in New Jersey with those of the New York City (surface street) Railway Co. W. G. McAdoo, 15 Wall street, New York city, is President.

NIPISSING, OTTAWA & MONTREAL.—Application is being made at the current session of the Dominion Parliament for an act incorporating a company to build a railroad from a point on Lake Nipissing east to Montreal, with a branch line along the south side of the lake in a westerly direction to a point on Georgian Bay. Pearson & Denton, Toronto, are acting for the promoters.

NORFOLK & SOUTHERN.—A contract has been awarded to Jones, Luck & Co., of Roanoke, Va., for building an extension from Mackey Ferry to Plymouth, N. C., 10 miles. Grading is now in progress. F. L. Nicholson, Norfolk, Va., is Chief Engineer.

NORTH CAROLINA ROADS.—Press reports state that the Cape Fear Lumber Co., of Wilmington, N. C., is about to build a narrow gage logging road from Richardson's Crossing to Clarkston on the Seaboard Air Line, a distance of 15 miles.

NORTHERN PACIFIC.—Grading has been completed on the cut-off from Woodinville Junction, Wash., to Renton, 24 miles. Five miles of track have been laid, and it is stated that work will be resumed as soon as the weather permits.

OAKLAND, CHARLESTON & WESTERN.—A charter has been granted this company in Mississippi to build a railroad from a point near Oakland on the Illinois Central southwest to Charleston, Miss., 10 miles. W. T. Lambert, J. W. Sanders and Joseph Lorrimer, all of Oakland, Miss., are incorporators. This is reported to be an Illinois Central project.

PENNSYLVANIA.—This company has awarded the contract for building its two tunnels under the North River, New York city, to the O'Rourke Engineering Construction Co. The contract for the tunnels under the East River (New York to Long Island City) has been awarded to S. Pearson & Son, Ltd., a well known English firm. The latter company built part of the New York & Jersey tunnel in 1889. The contract prices of the Pennsylvania work have not yet been made public. Work will be begun at once.

PHILADELPHIA RAPID TRANSIT.—Work is progressing rapidly on the subway which this company is building under Market street in Philadelphia. It is stated that the line will be open from Fifteenth street to Sixty-third street by the beginning of 1906. The E. E. Smith Construction Co. has the contract for the section from the Schuylkill River to Nineteenth street. Work on this section is about half finished.

SAN DIEGO EASTERN.—Contracts for building this line from San Diego, Cal., to Yuma, Ariz., 225 miles, have been let to the San Diego & Imperial Construction Co., of San Diego, Cal. Surveys are now being made, and it is stated that work will be begun some time during the present year. H. H. Peters is President of the construction company. C. W. French, San Diego, may be addressed. (See Construction Supplement.)

SEABOARD TRACTION CO.—A charter has been granted this company in Virginia to build and operate an electric passenger and freight line 300 miles long from Richmond, Va., to Portsmouth. The capital stock of the company is $250,000. It is stated that work will be begun immediately. The principal office of the company will be at Suffolk, Va. L. R. Britt is President, and W. H. Robinson, Norfolk, Va., is Vice-President.

SOUTHERN PACIFIC.—It has been officially denied that this company has made an agreement with the Chicago, Rock Island & Pacific to build a causeway from the island of Galveston to the mainland.

The cut-off which this company is building from Montalvo to Burbank, Cal., 59 miles, is practically completed and will be open for traffic on March 20. Through trains will no longer run by Saugus route. The curves and grades have been reduced to a minimum by the boring of three tunnels, one of which, the Santa Suzanna, is 7,369 ft. long.

SOUTHWESTERN (LOUISIANA & NORTHWESTERN).—An officer writes that this company was recently incorporated in Alabama to build a continuation of the Louisiana & Northwestern from Natchitoches, La., south to a point on the Southern Pacific in Calcasieu or Acadia parish. Work will be begun not later than Aug. 1, but the time for receiving bids for construction and equipment has not yet been definitely fixed. G. E. Montgomery, Natchitoches, La., may be addressed. (See Construction Supplement.)

SPRINGFIELD, LINCOLN, BLOOMINGTON, PEKIN & PEORIA (ELECTRIC).—Articles of incorporation have been filed by this company in Illinois. It is proposed to build an electric railroad from Springfield northeast through Lincoln to Bloomington, 50 miles, paralleling the Chicago & Alton between these points. D. W. Hart, Lincoln; Logan Hay, Springfield; A. G. Kingman, Peoria, and others are incorporators.

SUWANEE & SAN PEDRO.—An officer writes that preliminary surveys have been completed for an extension from Perry, Fla., to Springhill, 50 miles. The work is light, with a maximum grade of 1 per cent. and a maximum curvature of 4 deg. R. N. Ellis, Jr., Live Oak, Fla., is Chief Engineer.

TIDEWATER R. R.—An officer writes that the proposed route of this road is from a point on the Virginia State line in Giles county east through Giles, Montgomery, Roanoke, Bedford, Campbell and other counties to a point near the city of Norfolk, Va., approximately 300 miles. No work has as yet been done, but surveys will shortly be begun. Thomas D. Ranson, Staunton, Va., is President, and B. T. Elmore, Roanoke, Va., is Chief Engineer. (See Construction Supplement.)

TENNESSEE CENTRAL.—It has been announced that this company will spend $500,000 on improvements during the coming year. The plans include a $40,000 freight house and yards at Nashville, Tenn.; additions to the Belt Line in and about Nashville; a car ferry across the Cumberland River and reballasting of the Hopkinsville division of the road. Plans for the freight yard have been approved and work will be begun soon.

TOMBIGBEE VALLEY.—Articles of incorporation have been filed by this company in Alabama. The proposed route of the new road is not stated. J. T. Cochrane and Samuel Cox, of Carrollton; C. P. Duke, of Fairford, and Wm. G. Cochrane, of Tuscaloosa, are incorporators.

WESTERN MARYLAND.—Governor Warfield, of Maryland, has signed two bills to facilitate the completion of this company's line from a connection with the West Virginia Central & Pittsburg to tidewater. One bill authorizes the Western Maryland to build along the Chesapeake & Ohio canal between Big Pool, W. Va., and Cumberland, Md., 65 miles. Work is now in progress on this line. The other bill allows the Western Maryland to cross the western branch of the Patapsco River in order to reach tidewater in Baltimore. (See Construction Supplement.)

GENERAL RAILROAD NEWS.

CHICAGO, ROCK ISLAND & PACIFIC.—On April 1 this company will take over the Choctaw, Oklahoma & Gulf, and will operate it as one of its divisions. The C., O. & G. controls about 1,000 miles of track in Oklahoma and Indian Territory.

CHOCTAW, OKLAHOMA & GULF.—See Chicago, Rock Island & Pacific.

PENNSYLVANIA.—*The Wall Street Journal* quotes President Cassatt, of the Pennsylvania, as saying that the construction and equipment expenditures on the lines east of Pittsburg for 1904, excluding the Northern Central and the Philadelphia, Baltimore & Washington railroads, which do their own financing, will amount to about $21,000,000. This sum will finish all the work now under way, amounting to about $15,000,000, together with the new work which was authorized by the Board of Directors at the last meeting, including this year's expenditures on the low-grade line between Thorndale and Columbia, which should be completed next year. On the lines west of Pittsburg Mr. Cassatt says: "The cost of completing and equipping the work now under way and the new work authorized will be about $10,000,000. The Pennsylvania Co., through its recent loan, has sufficient funds for this work with which to repay the Pennsylvania Railroad for the large advances made during the past year."

VERA CRUZ & PACIFIC.—By an order of the Circuit Court, Allan McLane, receiver of the Vera Cruz & Pacific, has been authorized to borrow $2,000,000 on the securities of the company for the purpose of completing and equipping the line. The receiver is ordered to issue receivers' certificates bearing 6 per cent. interest as a first lien on the securities. These securities are payable in March, 1906, but may be redeemed one year earlier.

WABASH.—A special meeting of the stockholders of this company will be held in Toledo, on March 22, to vote upon an increase in the common stock of $50,000,000 and to ratify the execution of the trust agreement between the Wabash and the Bowling Green Trust Co. as trustee to secure an issue of $10,000,000, first lien, 50-year, four per cent. terminal gold bonds.